THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIX. No. 1767.] LONDON, MARCH 23, 1897. [49TH YEAR. PRICE 6d.

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FOR
GAS, STEAM, WATER,
AND ALL PURPOSES,
ALSO
COILS OF EVERY SIZE AND SHAPE.

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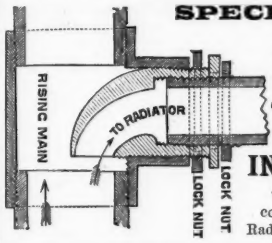

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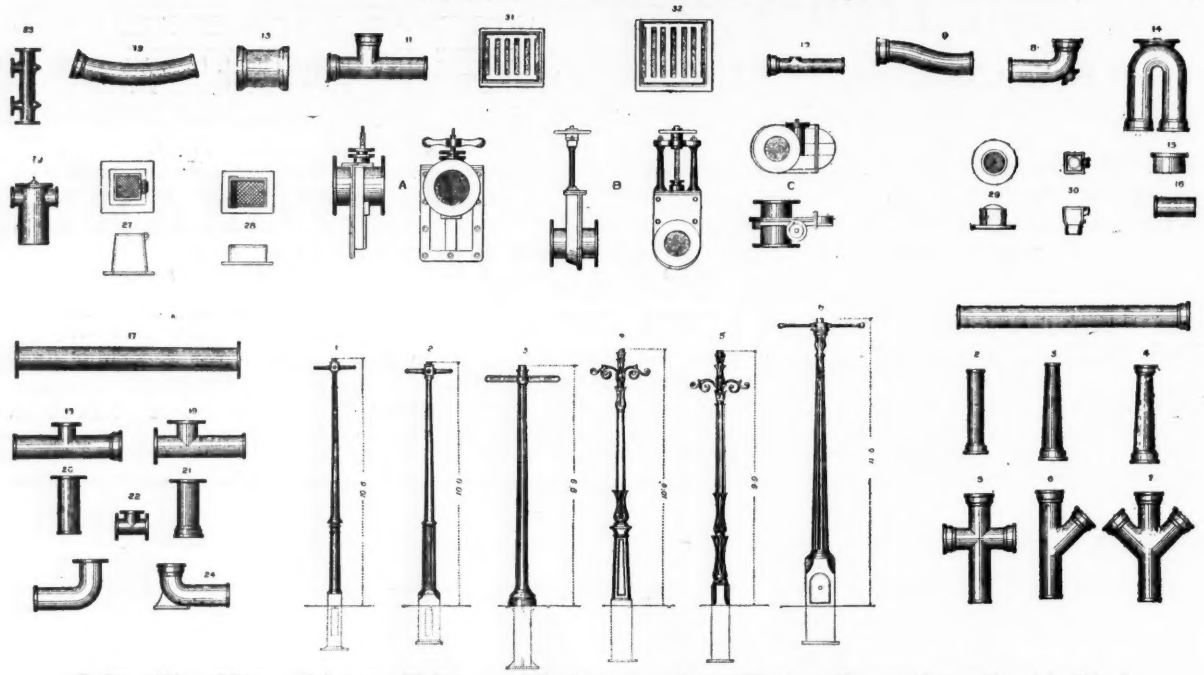

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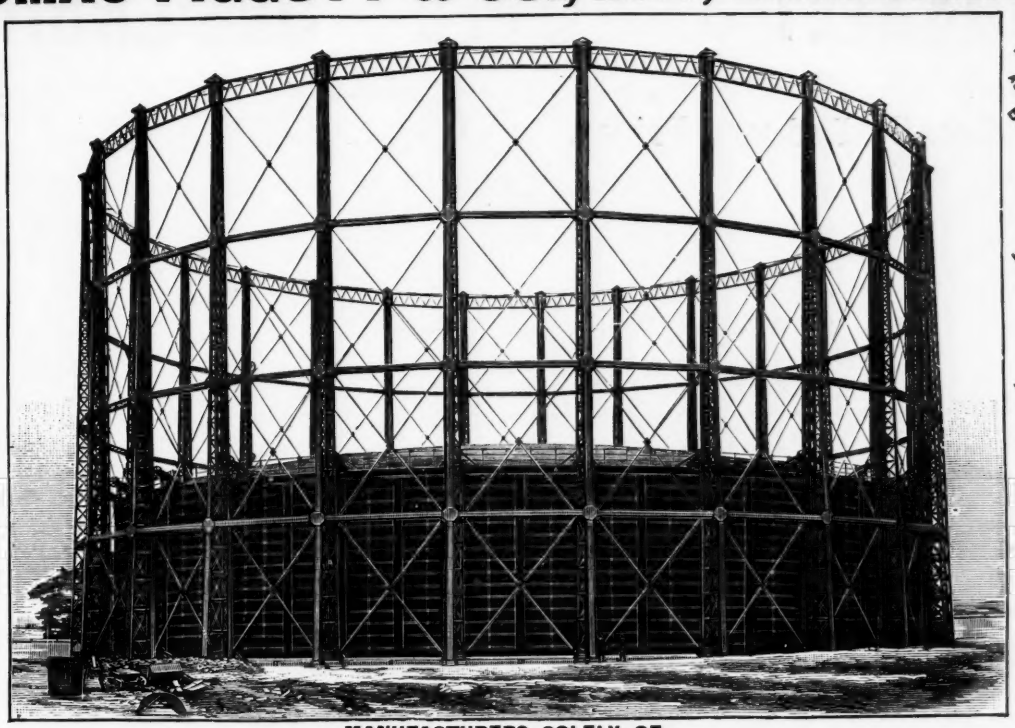

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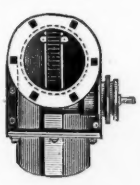

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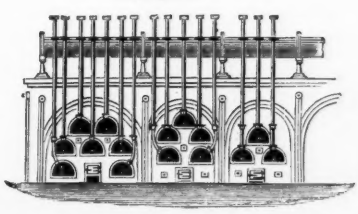

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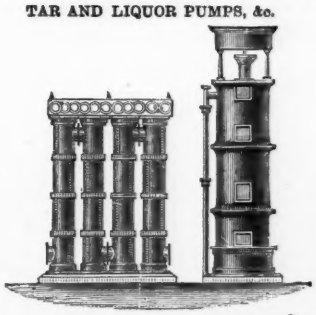

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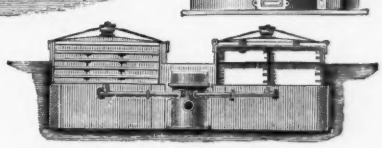

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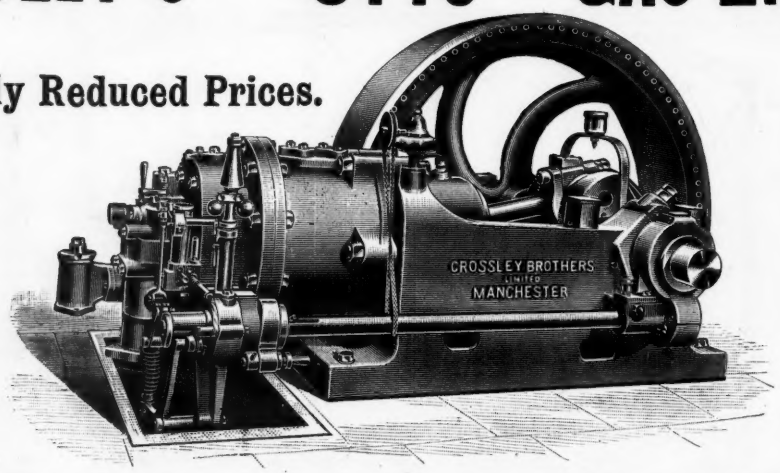

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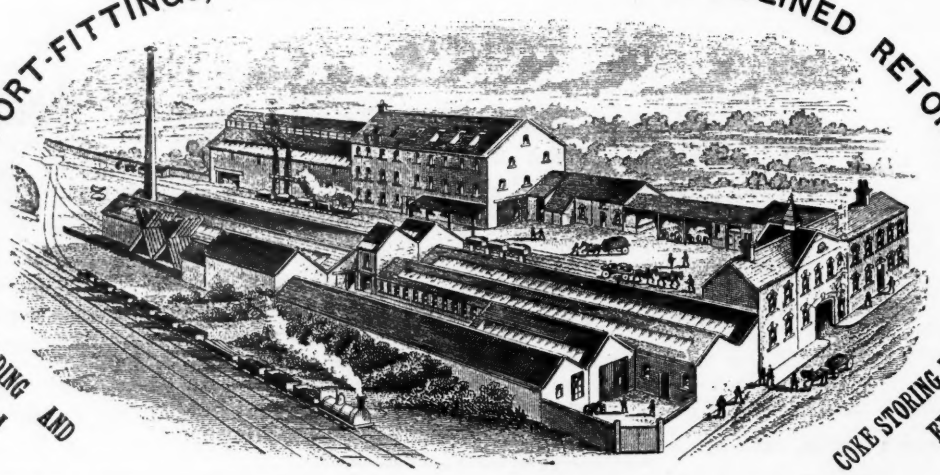

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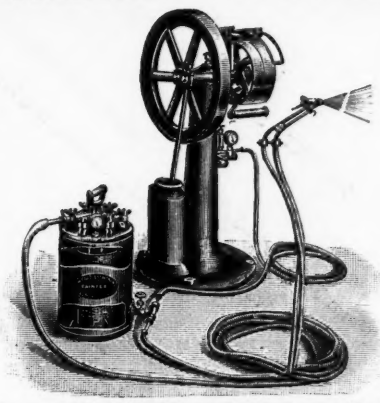

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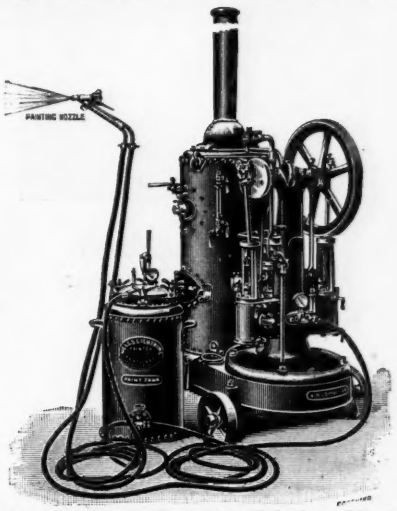

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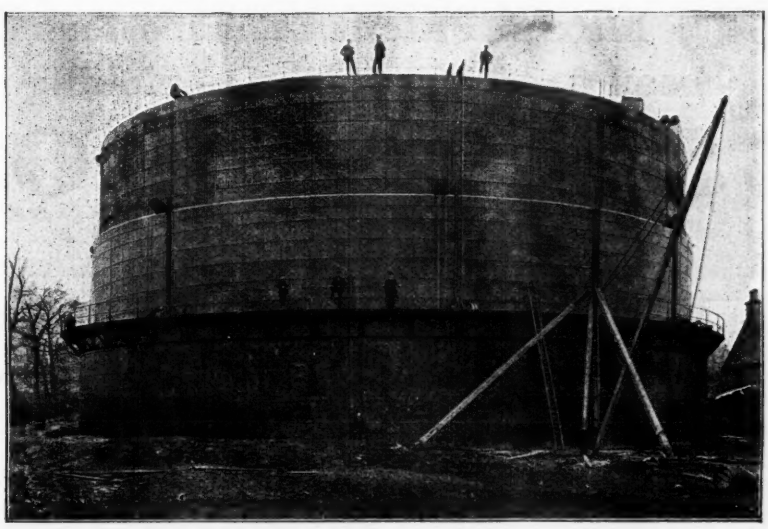

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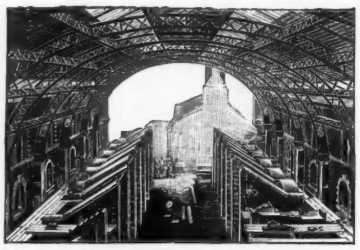

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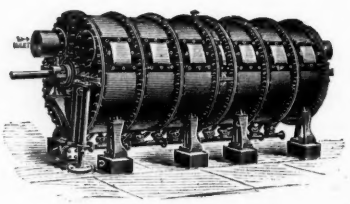

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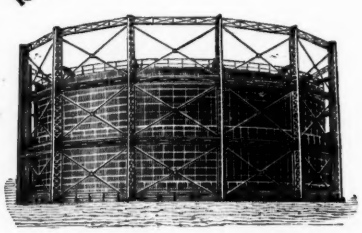

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FOR ENRICHING GAS IN BULK.

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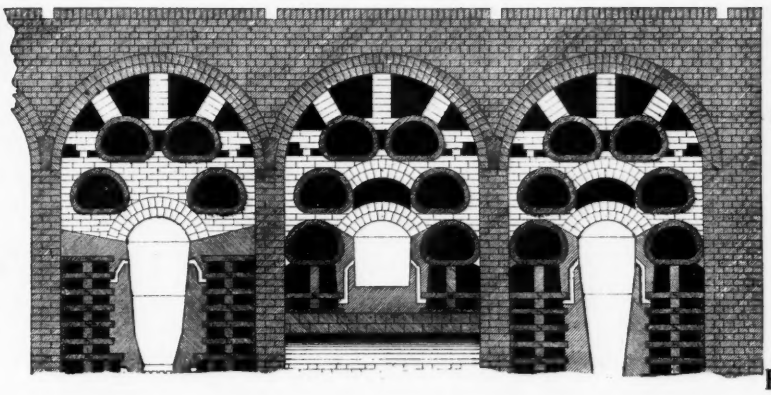

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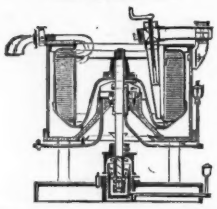

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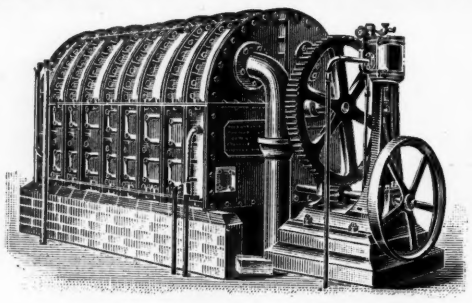

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In use and in course of Construction.

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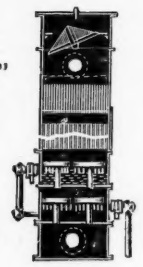

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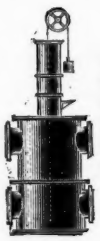

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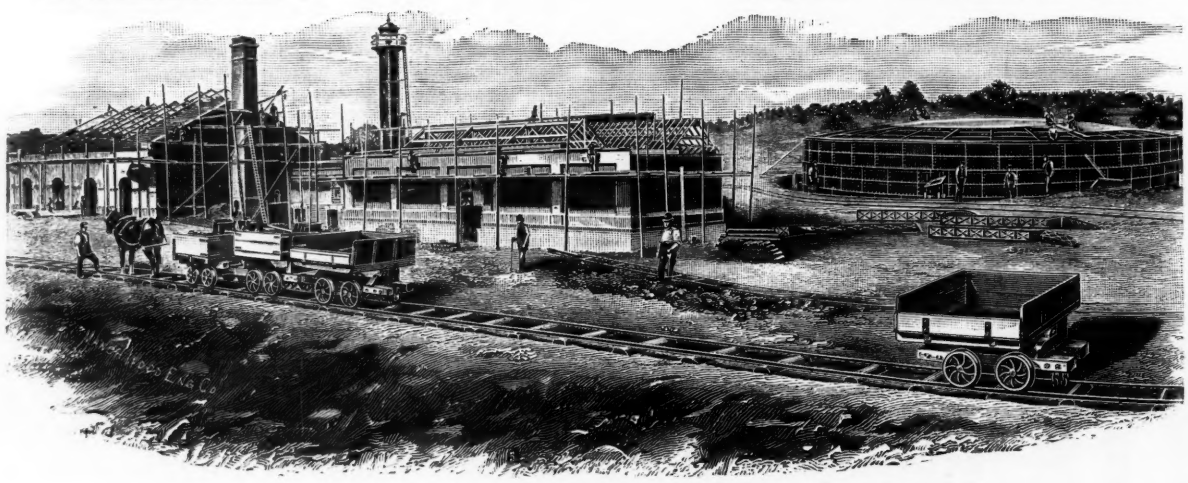

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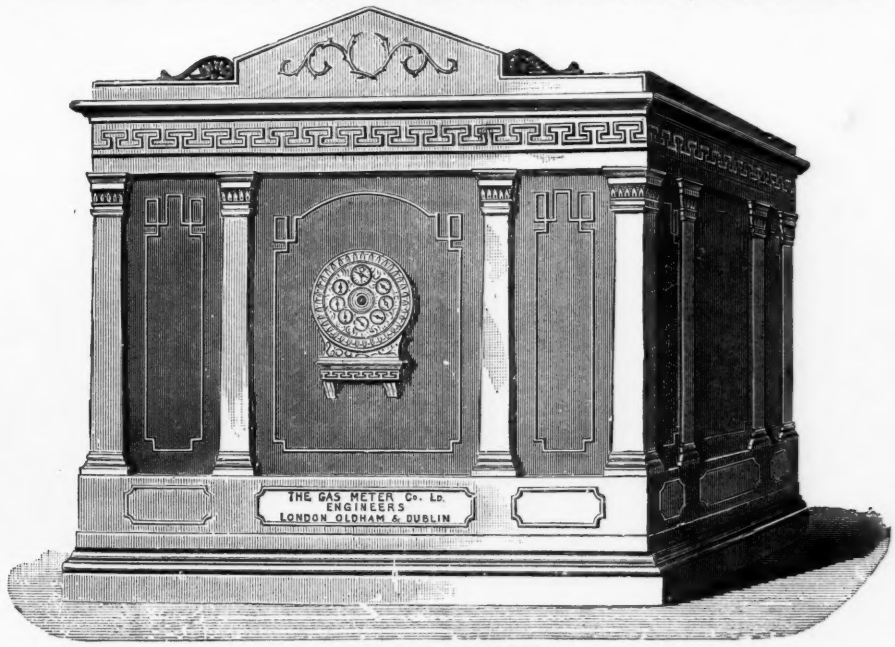

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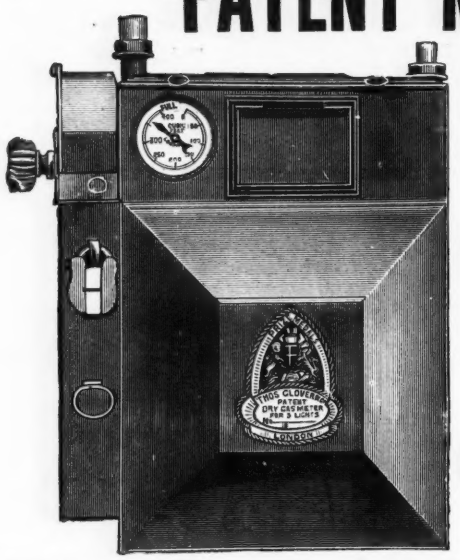

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[See also Advt. p. 692.

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EDITORIAL NOTES.

The Labour Questions of the Week.

SEVERAL "labour questions" engaged public attention last week; the most prominent being the dispute in the engineering trade, and the still unsettled Bethesda case. In regard to the former matter, it was reported that, in so far as the original question at issue at Sunderland might well be characterized as a "boundary dispute," the federated Trades Societies implicated were willing to withdraw the man at Pallion from his employment on the machine, and so avert the threatened lock-out. This offer was submitted to the north-east coast engineering employers, and will be considered at an early meeting of the Executive Board of their Federation. Meanwhile, notices have been posted terminating the engagements of the members of the Amalgamated Society of Engineers at all the federated works. It is clear that the withdrawal of a particular workman in these circumstances would not be a permanent solution of the question of principle. It might, on the other hand, prevent the creation of bad blood at the outset of negotiations, which, if they are to result in a settlement of lasting value, must not be hampered by personal considerations. It is to be hoped rather than believed that the threatened storm will blow over this time. The men's executive must feel that they would be fighting on unsound ground if they were to strike upon the bald question of men *versus* machinery; but so long as this is the real issue, the employers will hardly be so weak as to allow it to be obscured. In the Bethesda affair, some hopes were entertained early in the week that the carefully-arranged meeting of Friday last between Lord Penrhyn and his revolted quarrymen would open the way to the resumption of work. But the aspiration has proved illusory, owing to the non-removal of the points of principle upon which the parties are divided. The question of the Quarry Committee still bars the way. Lord Penrhyn told his workpeople to their face what he has said all along—that, while they are entitled to combine in any lawful way, he will continue to insist upon the absolute freedom of both employer and employed from any interference or dictation from a Committee. The meeting vigorously discussed this point. The leaders of the men's deputation, being themselves Committeemen, contended for the recognition of this institution; and Lord Penrhyn was immovable from the position that, while he could not prevent the existence of a Committee, he would not recognize or deal with it in any way. Hence the deadlock is as hopeless as ever; and nothing less than sheer necessity on one side or the other can remove it. It remains to be seen which side will feel this pressure first; but on all counts the advantage would appear to be on the side of the employer.

Since the above lines were written, further intelligence has come to hand confirming the accuracy of our interpretation of the position at Bethesda. A mass meeting of the quarrymen was held on Saturday, which was addressed by the strike leaders who had seen Lord Penrhyn on the previous day. The foremost of these personages declared that "they must now fight for the recognition of the right to "combine; and he trusted when they had secured that "recognition they would diligently exercise the right." Another speaker repeated the original strike resolution of Sept. 30 last, which asserted that the men were "out of "employment on the vital question of the right of working-"men to combine." This declaration of principle was re-affirmed by the meeting. Hence there is no misunderstanding the nature of the issue. What the men mean by the right of combination is nothing less than power to manage their employer's business in their own interest; and this Lord Penrhyn has said over and over again that he will never yield. He knows by experience that he may as well keep his slate in the ground as permit the control of the quarries to pass into the hands of the men. If he were disposed to weaken ever so little in regard to this point of principle, Saturday's declarations would effectually settle his mind. "Defiance, not defence," is the Trade Union motto; and not until the order of the words is changed will it be possible to see the end of this deplorable conflict. Meanwhile, the dispute is an unmistakable object-lesson of the futility of Government or other Conciliation Boards. It is all very well to talk amiably about arbitration as a good substitute for war, so long as there is no immediate

occasion for either. Since the world began, however, there have been causes of division among men upon which not even an archangel would have found it possible to arbitrate. These quarrels have always been settled, if at all, by the simple old way of fighting it out; and here in 1897 there remain as many things to fight about as ever there were, with some more added. Recognition of the principle of Trade Unionism is one of the latter category.

Gas Bills in Parliament.

PARLIAMENT was again busy last week upon Gas Bills. The rival Malvern purchase schemes were before a Lords Committee last Tuesday, and resulted in the acceptance of the proposals of the Malvern Link District Council. For particulars of the two Bills relating to the gas supply of Malvern and its neighbourhood, we must refer our readers to the abstracts which we published in the "JOURNAL" for Jan. 12 (p. 74). The contest between the two Local Authorities interested is a striking proof of the necessity for some powerful central authority to see fair between such rivals, each of whom can make out a plausible case in the public interest. All the same, it is scandalous that so much public money should be squandered in these disputes. The Bill promoted by the Lowestoft Corporation to enable them to acquire the undertaking of the local Gas and Water Company was thrown out by the same Lords Committee that sanctioned the purchase of the St. Anne's-on-the-Sea Gas-Works by the District Council. It would be a wonderful convenience if these Committees only acted in such a manner, in dealing with Gas and Water Bills, that one might deduce some sort of principle from their decisions. Of course, it is no more than a coincidence; but it happens that this particular Committee have alternately passed and rejected the preamble of all the Bills that have come before them. The Weymouth Gas Company's Bill was passed and reported by the Commons Committee that dealt with the Ashford Bills.

The Inclined Retort Patent Litigation.

DURING three days of last week, Mr. Justice Romer had before him the long-expected suit of the Automatic Coal-Gas Retort Company against the Salford Corporation, in respect of the alleged infringement by the Corporation of the inclined retort patent of M. André Coze, which is the property of the Company. The hearing is to be resumed to-day, and will probably not occupy many days longer. We cannot, of course, go into the merits of the case; but we are free to describe the origin and course of the litigation, so far as it has gone. It arose out of the action of the Corporation of Salford in erecting at their gas-works inclined retort plant in accordance with the designs of their Gas Engineer—Mr. S. Y. Shoubridge. This plant the Automatic Coal-Gas Retort Company claimed to be an infringement of their patent rights, which the Corporation denied. It was impossible to settle the dispute except by appeal to the Court; and this course the Company found themselves driven to take as the alternative to seeing their supposed monopoly of the inclined retort system disappear. Owing to various circumstances, the action has been a long time in hand; but the question has been brought to an issue at last. The Company are represented on the trial by Mr. Fletcher Moulton, Q.C., and Mr. Walter; and the Corporation have engaged Mr. Bousfield, Q.C., Mr. Roger Wallace, Q.C., Mr. Astbury, Q.C., and Mr. Roe Rycroft. A report of the first portion of the proceedings will be found in our "Legal Intelligence." It may be briefly stated that the plaintiffs have set themselves to maintain the originality and value of the first Coze patent, which was taken out in 1885, and to make it cover what the Corporation have done in this regard. The Corporation raise the usual pleas in their defence; and the Counsel engaged in the case on both sides are handling with consummate ability the interests confided to them. The report makes most interesting reading.

A Criminal Corporation.

ANOTHER stage has been reached in the painful and tedious gas litigation between Southport and Birkdale, which has had the somewhat paradoxical effect of leaving matters as they were before, only more so. It may be remembered that Birkdale had Southport up before the Magistrates for deficiency of illuminating power in the gas supplied to the former place; and Southport, by the Corporation, was visited with a penalty of £10 and costs. A special case was, however, stated by the Magistrates, which was heard by the Divisional Court; and this Court found that the Corporation were not bound to supply Birkdale with gas of the illuminating power stated in the Southport Improvement Act. Upon this Birkdale carried the case to the Court of Appeal. Here, however, the point was raised that there was no right of appeal, as the cause or matter was criminal in its nature. "The Corporation"—so the argument ran—"had been convicted and fined in a Police "Court, before five Justices of the Peace, under sections "39, 40, and 41 of the Southport Improvement Act; and, "that being so, there could be no appeal from a Divisional "Court on a special case stated for its consideration." Naturally, Birkdale did not see the matter in this light. It was contended on their behalf that the Corporation could not be treated as criminals merely because, under a Private Act, Police Court proceedings had been taken against them—proceedings, moreover, that could not be followed by imprisonment. This was a difficulty, so far as it went; Corporations being proverbially destitute of the means whereby ultimate correction might be applied to them. It was also argued that the fine paid by the Corporation upon conviction was of the nature of a forfeit. Notwithstanding all this, the Court held that the objection to the appeal must prevail, because the matter was clearly a criminal affair, begun in the ordinary way by the laying of an information, and ended by the imposition of a penalty on conviction. The Master of the Rolls and Lords Justices Lopes and Chitty have concurred in this judgment; so there must be no lingering suspicion of doubt about it. As the old saying has it, a man is not necessarily a horse because he was born in a stable; but a Corporation that has been haled before the Magistrates and convicted in a Police Court, albeit only for supplying gas of deficient illuminating power, becomes thereby a "criminal" of the ordinary kind. It would be easy to draw farcical inferences from this curious legal conclusion; but there is the satisfactory feature in it that it imposes a welcome limitation to proceedings like those in question.

The Right of Burgesses to Inspect Corporation Minutes.

AN important action brought by Mr. Norbury Williams and another against the Manchester Corporation, to test the right of burgesses to inspect the minutes of a Town Council and its Committees, has been decided by a Divisional Court in the sense desired by the plaintiffs. The point at issue was a curious, yet at the same time a very simple one. The Municipal Corporations Act, section 233, gives to a burgess the right to inspect the minutes of proceedings of his Town Council on payment of a fee of 1s. It is further provided that the burgess may make a copy of, or an extract from, the minutes, or a Council order for the payment of money. This is all very well in theory, and appears to give disclosure of all the proceedings of a Corporation. As a matter of fact, however, the business of such a Corporation as that of Manchester is transacted by Committees of the Council. The minutes of these Committees are not minutes of the Council; and, under a Standing Order, an epitome of them, prepared by direction of the Town Clerk, and countersigned by the Chairman, is recorded every month. The minutes kept by the Council merely refer to the proceedings of the Committees by stating that they are approved. Hence it is of little use for a burgess to have access to the minutes of the Council unless he can also get at the minutes of the Committees; but this has always been refused in the case of Manchester. In order to settle the legal question, the plaintiffs duly applied for an inspection of the minutes of proceedings of the Gas and Rivers Committees, which are referred to in the minutes of the Council as having been read and approved; and they tendered the fees mentioned in the section. The application was refused; the Corporation objecting to produce the Committee's minute-books on the ground that the publication of their contents would be inimical to the interests of the citizens of Manchester. Before the Court, the plaintiffs contended that the system followed at Manchester was such as to render nugatory the provision of the Act already referred to, inasmuch as it was impossible to ascertain from the Council minutes what the proceedings of the Corporation actually were in regard to any matter. This practice was condemned by the Court as contrary to the intention of the Act. The existence of objection to the disclosure of preliminary and confidential minutes of Committees was, however, admitted; and the plaintiffs stated that they did not want to pry into the

business of the Committees as such, but only to be able to ascertain what acts and proceedings of Committees had actually been reported to the Council and adopted. Hereupon the Corporation magnanimously admitted that the form in which the Council minutes have been traditionally kept gave considerable colour to the plaintiffs' claim. In the end, it was promised, on behalf of the Corporation, that there should be an alteration in this respect. The epitome of Committee minutes already mentioned is to be open to inspection. A formal engagement was given that burgesses shall henceforward be allowed, in the terms of the Act, to inspect the minutes of acts of the Committees submitted to the Council for approval; and an order of the Court was made accordingly. The plaintiffs' costs will be paid by the Corporation.

Gas Explosion in Boston (Mass.).

THE name of "street subway" is never a very comforting one to a gas engineer. Whenever it is mentioned, it is usually in connection with something that is to be done to his mains. The chances are that every time a city roadway is "up," in the technical sense, a number of letters appear in the newspapers advocating the construction of subways into which all pipes and tubes are to be moved; and the suggestion usually follows that the owners of these things ought to pay the cost of the subway. The general public cannot be expected to know that, from the point of view of the gas engineer, a main comfortably bedded in the subsoil of the highway is in the best of all possible conditions. He does not want a subway, and certainly does not see why he should be made to provide the cost of such a construction. The public lose sight of the circumstance that gas mains and services are rarely disturbed in the busiest thoroughfares, where on other accounts subways might be desirable. In such streets, every house is connected with the gas-main; and this connection is always of long standing. The gas engineer seldom needs to touch his most profitable mains and services, and is only thankful when all other people will likewise leave them in quiet. Unhappily, this is precisely what they will not do. Most gas explosions and fires traceable to street mains and services are direct consequences of the operations of others than the owners of this class of property; and the observation applies to the latest instance of this kind of trouble, which occurred in Boston, Massachusetts, on the 4th inst., briefly recorded by cablegram last week. The particulars of this serious accident will be found in another column. It appears that a street subway is in course of construction in the centre of the city, and the gas-mains were left without adequate support in a part of these works where there happened to be a void space underneath the temporary surfacing. Somehow, the mains broke, and the escaping gas made an explosive mixture in the space referred to, which was fired—apparently by a spark from an electric tramcar. The result was disastrous. Three cars loaded with people were wrecked, besides other street conveyances that happened to be upon the spot at the time. Six people were killed outright, and about forty more injured. The damage to property was considerable. Altogether, this seems to have been one of the gravest accidents that has ever been recorded in the annals of the gas industry. It was obviously all due to the subway. A gas-main under considerable pressure may be broken in half in a common road by the passage of an extraordinary weight, such as a steam-roller; and injury to the public seldom comes of it. Given a subterranean cavity, however, in which an explosive mixture of gas and air can be formed and retained, and the result is likely to be very different. A few minutes will suffice, under the proper conditions, to convert an unventilated subway into a mine capable of spreading death and destruction around. Hence it is no wonder gas engineers do not like subways. The sympathy of the industry at large will be extended to the Boston Gas Company in this their tribulation.

The Engineership of the Crystal Palace Gas Company.—With reference to the paragraph last week announcing the relinquishment by Mr. Charles Gandon, M.Inst.C.E., of his position as Engineer of the Crystal Palace District Gas Company, we learn that the Directors, at their meeting last Friday, appointed as Mr. Gandon's successor Mr. Sydney Yarrell Shoubridge, the Gas Engineer of the Salford Corporation. Mr. Shoubridge went to Salford in 1888, shortly after the dismissal of Mr. Samuel Hunter, previous to which time he was with Mr. Henry Hack at the Saltley station of the Birmingham Corporation.

WATER AND SANITARY AFFAIRS.

THOUGH the remarks made by Lord George Hamilton when presiding at the meeting of the Council of the London Municipal Society last week must be taken quite apart from his position as a member of the Cabinet, still they carry peculiar weight as coming from a statesman of such eminence. Perhaps we may go a step farther, and speculate on the extent to which such views as were expressed by Lord George are likely to influence the Government. Speaking of the Progressive party in the London County Council as actuated by an insane craze to multiply the duties of that body, his Lordship went on to observe that this desire to aggrandise themselves had found expression in the policy of the Council; the result being seen in sundry proposals which were certainly not compatible with the financial interests of the ratepayers. As an illustration, Lord George Hamilton referred to the Council's Water Bills. He confessed that he would like to see the water supply of the Metropolis placed under the control of a public authority; but he contended that, if this were done, it must be on terms which were fair to the Companies, and not ruinous to the ratepayers. Lord George considered that, if the Companies were bought up as a whole, the transaction might not be unprofitable; and he argued that it was from the outer area that profit would mainly accrue for the future. In order to secure the Metropolitan area for themselves, the County Council had now proposed to buy off opposition of the outside authorities, on terms which his Lordship looked upon as an excessively hard bargain for the people of London. These proposals had been rejected by Parliament; and, in contrast, Lord George put what he described as the tentative proposal of the Government. The latter, he thought, would lead in the long run to the Water Question being settled on terms alike equitable to the Companies and to the ratepayers. These views were endorsed in a speech which followed from Sir Horace Farquhar. If that which Lord George Hamilton has thus said on the London Water Question fairly indicates the mind of the Government, it may be taken to show that the separation of the inner from the outer area is not looked upon with favour by the present Ministry; and that the principle which underlay the Water Board Bill of last year is that which they still entertain. If there is to be one authority and one area, the London County Council must be content to send representatives to a Water Trust or a Board. Even the scheme of the Council comprehended a Statutory Committee, on which the Corporation of the City were to be represented. In like manner, the Council may be called upon to submit to being represented on a central power governing the whole water area of London. The "insane craze" which prevails at Spring Gardens sets itself against so reasonable an arrangement; and we now witness the infatuation by which the Welsh scheme is still pushed forward, in defiance of the report by Lord Balfour's Commission, and in utter disregard of the fact that the Government are going to launch another Royal Commission, besides bringing in a Bill to extend the present system of control. The County Council have one will and one way, whatever may be the mind of Parliament and the Government, and whatever may be the reports of Royal Commissions. How this will end becomes a matter for serious consideration. Perhaps the elections next March will answer the question.

It might have been better for the Progressive party had they lost the Whitechapel election, than by winning it to bring down upon their heads such a rebuke as they have received from "The Times." It is not often that the thunder of Printing House Square sounds so loud as on this occasion; indignation being aroused by the wretched tactics satirized by the leading journal as corresponding to a maxim in Progressive English to "Get votes—"honestly if you can—but get votes." The Progressives did get votes for their candidate; but on such utter misstatements respecting the water supply, that whatever else may be said of the latest member of the Council, it cannot be asserted that he represents the intelligence of Whitechapel. The voters who supported him were doubtless honest; but if they thought that in so doing they were vindicating the cause of the water consumer, they were immensely mistaken, and may be classed among the "simple-"tons" referred to by "The Times" as being persuaded that the real cause of the so-called water famine was to be

found among those who did their best to prevent it. The leading journal describes the Progressives as making political capital out of the shabby and shallow device of preventing the East London Water Company from obtaining the powers they sought for the construction of new reservoirs, and then denouncing the Company as the culpable authors of all the sufferings which these reservoirs would have averted. The Progressive party are thus charged with an impudent perversion of facts, and as having indulged in audacious misrepresentations. But all this answered its purpose; and the party have carried their man. Whitechapel is to be commiserated as having been deceived; and we can only hope it will be disillusioned by the time of the triennial election.

By a curiously inconclusive letter he has addressed to "The Times," Mr. Shaw Lefevre has sought to justify his opposition to the East London Water Bill of 1894. Mr. Banbury promptly replied, and "The Times" has thoroughly endorsed his statement; in so doing accusing Mr. Shaw Lefevre of assuming a preposterous attitude. He and his Progressive friends are truly described as seeking to thwart whatever might strengthen the position of the Water Companies, without any regard to the public loss and the inconvenience that might accrue from their political manœuvres. Such expressions as these from a powerful and independent journal ought to have an effect both in and out of Parliament; and we cannot but feel encouraged—despite the blunder down in Whitechapel—to maintain the hope we have before expressed, that, on the whole, the people of London, as well as our legislators, are becoming more fully educated in regard to the water question, so as to understand its real merits. In a second letter addressed to "The Times," Mr. Shaw Lefevre has argued in respect to the water supply that a uniform system controlled by a single authority is better than a number of separate districts. We should like Mr. Shaw Lefevre to reckon up how many separate districts, and how many authorities, would have been created by the scheme of the Purchase Bills. We might make further allusion to correspondence in "The Times," as in the case of Mr. Crookenden's reply to a letter from Mr. Sydney Buxton. This is mainly a question as to charges, concerning which the able Secretary to the East London Company gives the correct data. It is well that the Water Companies should not maintain that policy of silence which has so greatly characterized them in the past when attacked by error and prejudice. The Southwark and Vauxhall Company may be congratulated on the circumstance that, by special leave of the Standing Orders Committee, they have been enabled to deposit a Bill by which they seek power to increase the quantity of water they may take from the Thames. The measure is the outcome of the proceedings taken against the Company by the Conservators of the Thames early in the year; and it is to be hoped that it will pass through Parliament.

Mr. Dibdin's letter, resigning his post as the Chemist of the London County Council, was dealt with last Tuesday. After some discussion, the resignation was accepted; and the only modification to be looked for is that the Council may retain Mr. Dibdin's services for a time as Consulting Chemist, though nothing definite appears as yet on that point. We are glad to find, in the columns of "London," a very fair appreciation of the services rendered by Mr. Dibdin to the Council and to the ratepayers. Producing better results by cheaper means, founded on advanced scientific principles, he has saved several millions of money, which otherwise would have been required for the execution of engineering plans in relation to the sewage. We fear that even now his departure will lead to an enhanced expenditure of capital. The Council would have been wise to have made it worth Mr. Dibdin's while to remain with them; but last Tuesday would have been too late. The die is cast; and at the close of June Mr. Dibdin will enter on that career, in the shape of private practice, which he has long desired. We have not always agreed with him on certain public questions; but we have ever appreciated his ability and his straightforwardness. We conceive that his extraordinary success, as a chemist, in dealing with the sewage question, ought to have gained from the Council a recompense which has been signally wanting. As Dr. Longstaff said on Tuesday, no one has saved London more than Mr. Dibdin; and he has been shamefully underpaid. For his own sake, it is well that he leaves; but on public grounds, his departure may be regretted.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 678.)

Business on the Stock Exchange last week was reduced to a very low point. The development of the Eastern tangle is proceeding so slowly and gradually, that the public as a rule seem resolved to hold aloof from the markets until some perceptible progress in the solution of the position can be discerned. This attitude made the markets sensitive of slight influences; and very little buying or selling sufficed to set them oscillating. The preponderating tendency was downward; but no really important change was made. The Money Market was dull and quiet, sharing the inanition of things in general. In the Gas Market, business was somewhat irregular. It began sluggishly enough; but in a day or two, it quickened up considerably—falling away again, however, towards the close. Movements in point of price were also variable; good issues belonging to the same class marching in different directions, probably in obedience to a slight demand for the moment on the one hand, or the lack of it on the other. In Gaslights, the "A" opened strong, though not particularly active, and looked as if it were going to make a better price. But a change set in, and the support began to waver; so that the closing prices fell away, and the quotation lost a point. The secured issues, however, were strong; and the "B" 4 per cent. had a smart rise. South Metropolitan, too, was a little weaker. It hung fire for some time between 145 and 146, and, failing to improve its position, fell back a point. There was a shade more activity in Commercials; and the old stock changed hands at a large advance. The Company will meet next week, and declare their dividend. Transactions in the Suburban and Provincial group were of the smallest proportions; and no change in any of the quotations was made. The Continental Companies were quite as active as any in the whole list. Imperial Continental was steady, and closed without a show of wavering. European and Union maintained their prices, but did not offer to advance them. Slight movements were apparent among the rest. Melbourne and San Paulo were better; but Monte Video fell off. The Water Companies were very quiet. Prices generally were pretty good, and New River advanced; but East London lost the points it made the week before.

The daily operations were: Business in Gas on Monday was rather restricted; but good prices were made. Commercial old rose 6; and Brighton and Hove, 2. The position on Tuesday was much the same. Gaslight "B" advanced 1½. In Water, East London receded 2. On Wednesday, business in Gas fell to its quietest point; and quotations did not change. In Water, New River rose 2. There was a great access of activity on Thursday; most of the leading issues being busy. Prices, however, were not quite so good. South Metropolitan dropped 1; but San Paulo was ½ better. Friday was not quite so brisk; and prices were no better. Monte Video lost ½. Saturday produced no improved tendency; and Gaslight "A" fell 1.

ELECTRIC LIGHTING MEMORANDA.

A Prize Paper—Interior Wiring for the Electric Light—Danger of a Combined System—A Prepayment Supply System for Taunton.

It is an open question whether the cause of scientific progress really gains by the system of prize awards for papers contributed to the transactions of scientific societies. There is good reason for the encouragement of writers of papers by the offer of premiums of reasonable amount—sufficient (say) to defray out-of-pocket expenses; but when valuable money prizes have to be bestowed for communications written to order, the result is rarely satisfactory. An example in point was recently supplied by the Society of Arts, which awarded a Fothergill prize of £25 to Mr. Frederick Bathurst for a paper on the subject of "The Prevention of Fires due to Leakage of Electricity." This composition really turned out to be a warmed-up paper devoted under a thin disguise to the advocacy of a proprietary system of house wiring. It is difficult to believe that this is the sort of thing the founder of the prize desired to encourage. The prevention of fire risks due to leakage of electricity is a worthy aim; but there is no mystery about the means for accomplishing it. Mr. Bathurst has a plan of his own for effecting this purpose, which may or may not be better than the others; but in any case it is not a singular suggestion, nor at this time a new one. Curiously enough, the associated Fire Offices do not entertain a favourable opinion of Mr. Bathurst's system, which consists in the employment of insulated wires enclosed in metallic pipes. The central station interest is not with Mr. Bathurst either, for his plan is an expensive one to carry out; and, as Mr. Arthur Wright plaintively observed in the course of the discussion, it is useless for supply companies and corporations to reduce the price of current so long as the wiring runs to £1 a lamp or thereabouts.

This question of the cost of interior wiring is one of the most important that central station administrators can take into consideration at the present epoch in the development of the electric lighting industry. The facts concerning electricity generation and supply are now pretty well known. The day of devices for encouraging the artificial development of central station

working in fancy departments is over. Whatever may be the future experience of electrical touts in out-of-the-way places—and, for all our modern facilities for the dissemination of information, it takes a long time for the truth about such a matter as electricity supply to penetrate to all parts of the kingdom—local authorities of important centres of population can hardly be deceived much longer with respect to the possibilities of central station working. Whether the troublesome "peak" of the ordinary lighting load diagram can or cannot be rendered less conspicuous with efflux of time, is a question that time alone can answer; but it is certain that where central station electric lighting fails to pay, the chief reason is want of business. The load diagram of the St. James's and Pall Mall Company may be as mountainous as that of a small town installation; but this similarity will not entail uniformity in other respects. The chief study of unprosperous central station administrators, therefore, should be not so much suggestions for reducing the generating expenses, as means of securing more patronage. This conclusion immediately raises the question of lamps and interior wiring. There is a comparatively easy way of dealing with lamps, which should undoubtedly be supplied gratis wherever it is necessary to push trade. But the wiring of houses is a more serious matter.

If it is of any comfort to the electric lighting interest to know the circumstance, we are able to state that the gas interest has suffered wofully in the past, and continues to suffer, from difficulties with interior piping very similar to those experienced by electricians in regard to house wiring. So that if the aspiration often expressed by electricians were realized, and house wiring were made as simple, safe, and inexpensive as gas-piping, they would still remain at a considerable distance from the ideally happy state. It is true that nowadays the Fire Offices do not make themselves offensive to gas consumers by classifying ordinary gas-fittings as constituting the house containing them a hazardous risk; but it took the offices a long time to get reconciled to gas lighting. We learn from Mr. Bathurst that there are objections to the common practice of combining gas and electric light fittings. He says: "Many instances can already be quoted where the union of gas with electric fittings has resulted in disaster to both—either lighting agency having the ability to release the other;" and he believes that "practical experience will show that, where gas or water systems are used concurrently in the same building with electric wires, unless an auxiliary insulation is provided between the insulated conductor and the metal-piping system, unlooked-for troubles will occur." This is a matter that has not escaped attention.

It is interesting to observe that an attempt to surmount the difficulty of popularizing the electric light is to be made at Taunton by the adoption of what is called, not quite correctly, "free wiring." This only means that the Corporation Electric Lighting Committee have entered into an agreement with a "Syndicate," under which the latter have permission to fit up houses with electric lamps on the "penny-in-the-slot" principle. We thought it was bound to come to this somewhere; and it may as well be at Taunton, where electric lighting has distinctly "gone off" in local estimation, as anywhere else. Henceforward, if the Syndicate fulfil their engagements, the people of Taunton will be able to get enough energy for a penny to keep an 8-candle electric lamp going for some six hours. For larger customers a half-crown fee has been arranged for. It will, at any rate, no longer be possible, after the new experiment has been launched, to hoodwink the public as to the real cost of electric lighting. A penny for an 8-candle lamp for six hours does not sound a high price, nor is it; but it is considerably more than need be paid for an equivalent amount of gas lighting by any consumer who cares to study economy. It remains to be seen whether the middleman can make money out of such an arrangement. In Taunton it will not be possible to keep up an extensive office establishment out of the proceeds of an enterprise of this kind. The idea, however, is not a bad one, and in some form or other is worthy of extended trial. People living in £50 or even £75 a year houses cannot afford to go in for electrical wiring; and the landlords will not do it.

The Proposed Purchase of the Ashford Gas-Works by the Urban District Council.—Mr. W. A. Valon, J.P., who is advising the Ashford Gas Company in the above matter, and who negotiated the terms of purchase during the progress of their Bill before the Parliamentary Committee, writes to point out that the terms were based on 24 years' purchase of the maintainable "profits," not "dividends," as stated, by inadvertence, in our comments on the case. Under these conditions, the Company will receive purchase of all profit, irrespective of dividend.

The North of England Association and Mr. W. Hardie.—The proposal to present to Mr. W. Hardie, the Hon. Secretary and Treasurer of the North of England Gas Managers' Association, a testimonial in recognition of his long service in this capacity, has been cordially received both within and outside the Association. The testimonial, the form of which will be determined after consultation with Mr. Hardie's family, will be presented at the banquet following the next half-yearly meeting, to be held, under the presidency of Mr. J. H. Penney, of South Shields, on Saturday, the 24th prox. On this occasion, a paper, "Testing Apparatus for Small Gas-Works" will be read by Mr. G. Sisson, of the Washington Chemical Company.

A GERMAN CONFERENCE ON ACETYLENE.

THE police of Berlin have recently announced that the manufacture and use of acetylene in the city must take place under the conditions made for explosives, and that its importation needs a special permit. Further, they require intimation of its proposed manufacture from calcium carbide, and require the apparatus to be constructed so that the pressure can in no part exceed 1·1 atmospheres. The apparatus, too, must be officially examined and passed before it is used. The numerous explosions traced to the employment of acetylene, and the publication of the police order, impelled the Berlin Section of the German Society of Chemical Industry to convene a conference in December last. The proceedings of the conference have since been published in the "Journal für Gasbeleuchtung;" and we give below a brief summary compiled therefrom. Special interest attaches to the remarks made, in view of the recent action of the Home Office and the Insurance Offices, in regard to the subject dealt with.

The President, Dr. C. A. Martius, briefly asked those present to express their views as to what precautions were necessary in dealing with acetylene, and to base their remarks on their own experiences. In view of the prospects of the industry, it was highly important that its development should not be hampered by too stringent regulations.

The first speaker was Dr. Frank, of Charlottenburg, who thought the mishaps with gaseous acetylene had been due to the blunders of unskilled workers, just as coal gas explosions occurred notwithstanding the warnings of past experiences. Its toxic properties had, he said, been overrated; 9 per cent. in air was not fatal to animals, whereas this proportion of coal gas was so. Phosphoretted and sulphuretted hydrogen were almost unavoidable impurities of acetylene produced from calcium carbide; and it was essential that they should be washed out by means of *acidified* solutions of metallic salts. The first of these impurities favoured the formation of copper acetylide. The method which he had given for its removal had proved satisfactory with the carbides produced as bye-products of the Hilbert-Frank process for producing phosphorus electrolytically. Such carbides were very rich in calcium phosphide. Water dissolved its own volume of acetylene; and the gas should therefore be stored over brine, in which it was almost insoluble. Acetylene produced from carbide which gave a yield of only 80 to 85 per cent. of the theoretical quantity was generally as pure as that obtained from material of higher value, as the common impurities of carbide were merely lime and carbon. When not under pressure, acetylene did not undergo explosive dissociation at 1110° to 1830° Fahr. Finely powdered carbide might be set on fire, but not made to explode, by the addition of water. When cleft by a chisel, carbide would give out sparks; but the flame was confined to the surface. Large lumps of carbide decomposed slowly in water, owing to the formation of a coating of hydrate. Though researches by MM. Berthelot and Vieille showed that acetylene could be safely compressed, it was cheaper to transport carbide than the compressed gas, owing to the great weight of the cylinders required for the latter. Some figures on this head had, he said, already been published.* He did not think very strict limitations on producers and users of acetylene were necessary, because at present the high price of carbide prevented its general use.

Dr. Frank was followed by Professor O. N. Witt, of Berlin, who remarked that acetylene was comparatively easy of liquefaction, as its critical temperature was 98·7° Fahr., and its critical pressure 68 atmospheres. Consequently, it is liquefied more easily than carbonic acid, of which the critical temperature is 88° Fahr., and the critical pressure 73 atmospheres. The steel cylinders used for compressed gases would, he said, resist a pressure of 300 atmospheres. If a cylinder containing some liquefied acetylene were heated to about 130° Fahr., the pressure within would perhaps reach 100 atmospheres. Merely as a compressed gas, liquid acetylene could not be regarded as specially dangerous; and the cause of the explosions which had occurred was undoubtedly its specific tendency to decomposition into its elements. Provided the temperature remained constant, the products of decomposition would occupy nearly the same volume as the acetylene; but, owing to the nature of the compound, the decomposition of acetylene was accompanied by liberation of heat. The great rise of temperature therefrom caused an immense increase in volume; and the pressure rose beyond the resistance of the best steel cylinder. Acetylene possessed a store of energy which was released by initial ignition; and in this respect it resembled modern explosives. It was harmless until incited by such ignition; and therefore it was essential one should learn precisely what factors might, in the first instance, determine its spontaneous decomposition, so as to guard against their occurrence. Knowledge of them was as yet imperfect; and therefore acetylene, especially when liquefied, should be handled with the greatest possible caution.

The next speaker was Dr. Th. Elkan, of Berlin. He said the production of acetylene did not appear to be specially dangerous, nor were its poisonous properties alarming. But there were risks attendant on its liquefaction. Technical men knew how to guard against the risks of liquefying gases in general; but the high value of acetylene had induced totally unqualified persons

* See "JOURNAL," Vol. LXVII. p. 24.

to attempt its liquefaction. Thus the condensing vessel of the apparatus might be left partially charged with the liquid; and a rise in temperature would then cause its rupture, owing to the great expansion of liquefied gases with increase of temperature. Similarly, a cylinder overfilled with the liquid might be ruptured. The German railways had fixed 83 cubic inches as the cylinder capacity needed per pound of acetylene; and if this limit were not overstepped, danger from compressed acetylene would be minimized. The latent energy of acetylene, as mentioned by Professor Witt, constituted its specific danger. Copper compounds with acetylene appeared to provoke a sudden molecular change of liquid acetylene into its elements; and therefore it was essential that neither copper nor its alloys should come in contact with the liquid. The phosphoretted hydrogen found in acetylene obtained from commercial carbide appeared to favour the formation of the copper compound. Copper had been eschewed at the Rheinau works for all valves and similar parts.

Dr. Tieftrunk, of Berlin, referred to earlier statements, and concluded therefrom that acetylene at atmospheric pressure was not specially dangerous.

An important speaker then followed—Professor Raoul Pictet, of Berlin—who said he had liquefied large quantities of acetylene at his Paris works. To preclude risk in production, it was essential that the carbide should be gradually introduced into a large volume of cold water, and the heat of the reaction taken up by external cooling with ice, or, on a large scale, by a system of pipes connected with a refrigerating machine. Before it entered the gasholder, the acetylene should be quite freed from impurities. At his works, he passed it first through a very strong solution of chloride of calcium, then through solution of a lead salt, and finally through sulphuric acid. All these absorbents were cooled to about 3° Fahr., at which temperature they did not combine with the acetylene. To compress and liquefy this purified gas, it was pumped into a preliminary cooler, in which it was brought to a temperature of −4° Fahr. by the evaporation, in a vacuum, of a mixture of sulphur dioxide and carbon dioxide. The cooler contained some waste wool, which retained traces of moisture. The pure dry gas was then passed into cylinders, where it was subjected to a pressure of eight atmospheres, and forced into a long tube kept at −112° Fahr. by means of the evaporation of a mixture of sulphur dioxide and carbon dioxide. At this temperature and pressure it was liquefied, and was charged into steel cylinders kept at the same temperature. This liquefied pure dry acetylene did not combine with copper or other metals, and was not exploded when its containing vessel was pierced by gun shots.

Several questions were then put to Professor Pictet; and, in answer thereto, he said that the explosion at his Paris works, which had been reported in the newspapers, was not caused by a spontaneous decomposition of acetylene. Among a large number of returned empty cylinders were some full ones. One of the latter was unwittingly put in a vice for the removal of the valve; and it there burst, owing to mechanical injury. The explosion was extremely violent, and unfortunately had fatal results. Nevertheless, several filled cylinders and a holder of gaseous acetylene which were in the room were not affected by it. The accident therefore showed that acetylene, whether gas or liquid, was really not extremely susceptible of spontaneous decomposition.

The Rating of Public Companies.—Probably some of our readers may remember that last session a Royal Commission was appointed to "inquire into the present system under which taxation is raised for local purposes." Lord Balfour of Burleigh was the Chairman; and among the members are the Town Clerks of Birmingham and Liverpool (Mr. E. O. Smith and Mr. H. E. Clare). Meetings of the Commission were held on the 11th and 12th inst.; and sittings have been arranged for each Thursday and Friday up to Easter. The importance to public companies of the inquiry thus instituted was emphasized by Mr. George Livesey at the last meeting of the South Metropolitan Gas Company—the question of rating having been dealt with at some length in the Directors' report. He said he thought it was desirable to show the Commission the absurdity and the difficulty of assessing public companies under the present system. Mr. Livesey has not confined his efforts to effect reform in this matter to the public utterance above alluded to, but has issued a circular discussing the question generally. He points out that the "fiction of a hypothetical tenant" is a most fruitful source of litigation, while the uncertainty and expense of the latter course lead to compromises which result in a rough kind of justice that often prevents the discontent from being openly expressed. The present tendency on the part of some rating surveyors, to try to make the rateable value approximate closely to the total divisible profit, is alluded to; and attention is called to the unsatisfactory position of public companies as compared with compound householders in the election and control of the rate-raising and rate-spending authorities. The present Commission gives the opportunity of having these matters investigated. With the view of bringing this about, a copy of the circular has been sent to the Chairman of every railway, dock, water, gas, tramway, and electric lighting company having property in London; and it is suggested that each class should confer together on the subject, and take action jointly or separately.

OBITUARY.

The death has lately occurred of Mr. C. W. Easterbrook, one of the oldest members of the Board of the Devonport Gas Company. He was one of the earliest subscribers to the Company, and joined the directorate in 1867.

Those members of the Eastern Counties Gas Managers' Association who visited Bury St. Edmunds in the spring of 1894 will regret to learn that Alderman T. Ridley, the Chairman of the local Gas Company, who was one of their guests at the dinner on that occasion, died last Wednesday. The deceased gentleman, who was upwards of eighty years of age, had spent a very useful life. For nearly a quarter of a century he had been a member of the Town Council, was twice Mayor, and was identified with many other institutions in the town, of which he was a native.

It was with much regret, which we are sure will be shared by the members of the North of Ireland Association of Gas Managers, that we received yesterday morning the announcement of the death last week, at the early age of 51, of Mr. Patrick J. Salmon, the Manager of the Galway Gas-Works. This sad event occurred in the Mater Misericordiæ Hospital, Dublin; and the funeral took place in Glasnevin Cemetery last Sunday. Deceased was not one of the founders of the Association; but he joined its ranks in 1890, and in five years had reached the highest position it could offer. Those of the members who attended the meeting held at Drogheda in 1895 under his presidency, will have many pleasant recollections of the delightful excursion which followed it. Mr. Salmon was a member of the The Gas Institute; having been elected in 1894. Deceased was a native of Dublin, where his apprenticeship days were passed with a firm of plumbers and gasfitters. He, however, could not stay the whole of his time; and he entered the service of the Alliance Gas Company. About a quarter of a century ago, he was in the United States doing good work in connection with the gas industry. Returning to Ireland, he became Manager of the Athlone Gas-Works; and about nine years ago he moved to Galway to take the position he held at the time of his death. There he effected many improvements in connection with the works and plant, and by his able management secured the confidence of his Directors; while his personal qualities gained him many friends. We sincerely condole with Mrs. Salmon and the family in their bereavement.

PERSONAL.

Mr. R. Hooton, who for the past two years has been Assistant-Manager of the Ashton-under-Lyne Gas-Works, has been promoted to the position held by the late Mr. David Clarke. Mr. Hooton was previously at Bolton.

Last Wednesday the Huddersfield Town Council confirmed the appointment of Mr. E. A. Harman to the position of Engineer of the Gas-Works; and they also promoted Mr. J. Sykes (the Chief Clerk in the gas office) to the post of Assistant-Manager.

Ex-Provost Wood, of Portobello, was last Friday presented with two handsome silver *jardinières*, with a suitable inscription on each, setting forth that it was presented by the Directors and shareholders of the Portobello Gaslight Company, for his valuable services as Chairman. Mr. Edward Bruce, the senior Director, made the presentation.

Mr. Alderman Ben Stocks, the Chairman of the Huddersfield Corporation Gas Committee, gave a complimentary banquet to the Committee and friends last Thursday evening, in commemoration of the completion of the reconstruction of the gas-works—Mr. W. R. Herring, the Engineer and Manager, being the guest of the evening. The occasion was taken advantage of to present Mr. Herring with an afternoon tea set and salver in silver, bearing the following inscription: "Presented to Walter Ralph Herring, Esq., by the members of the Gas and Finance Committees of the Huddersfield Corporation, upon his appointment as Chief Engineer and Manager to the Edinburgh and Leith Corporations Gas Commissioners, 18th March, 1897. Alderman John Lee Walker, Mayor; Alderman Ben Stocks, Chairman of the Gas Committee." The presentation was made by the Mayor.

At the works of the Ipswich Gas Company last Tuesday, Mr. J. T. Jolliffe, the Company's Engineer and Secretary, was presented with a handsome picture—"A Study in Fruit," by H. G. Todd—lately exhibited in the Art Gallery, in appreciation of his successful endeavours to establish the workmen's sick and superannuation funds, to which reference was made at the recent annual meeting. The presentation was made on behalf of the workmen by Mr. J. Lankester, the night foreman, and one of the oldest of the Company's employees. Mr. E. Hart, another old servant, presented Mr. Jolliffe with an album containing an illuminated address, to which were appended all the men's names. Mr. Jolliffe, in accepting the presents, said he was deeply sensible of the kindly feeling which prompted their bestowal upon him; but he wished for no recognition, as he was quite satisfied with the hearty way in which the men had entered into the suggestions for the formation of the fund. If any thanks were due, they should be given to the Directors of the Company.

NOTES.

Photometry at the Reichsanstalt.

Some interesting particulars as to the work of the Reichsanstalt—the National Physical Testing-Station and Laboratory of Germany—have recently been given in "Engineering," from the last annual report of the Directors. Among other subjects of research, the unit of light has not been neglected. The German sponsors of the platinum unit—Herren Lummer and Kurlbaum—have kept the idea before the authorities of the institution for several years; but it has not yet been found possible to do anything with it. Experiments in the reproduction of the Violle unit have been discontinued for the time being, though they have not been brought to a definite conclusion. Hundreds of fusion tests have been made with sheets of rolled platinum, according to the suggestion of Siemens, which, however, often gave way before the radiating surface attained the temperature of fusion. It was to be supposed that an incandescent surface of perfectly pure platinum would produce a constant radiation so long as the same temperature was maintained. It has now been proposed to constitute as the new unit the quantity of light radiated by one square centimetre of the surface of heated platinum at a temperature not yet fixed, but to be determined by the ratio of two measurements—one being the total radiation, the other the radiation after passing through an absorbing medium. When the ratio of these radiations is 10 : 1, the temperature of the platinum is to be considered as the normal for the establishment of the standard unit of light. It is stated that during the year 1895 the Reichsanstalt was hardly able to cope with the amount of work brought to it in connection with the testing of incandescent gas-burners. For some time 30 examples of this kind of burner were simultaneously being tested for duration up to 800 hours. It was observed that the minor points of construction, such as the adjustment of the pilot-light, shape of mantle, &c., are of considerable importance. The new patterns offered did not commend themselves to the experimenters. Generally it was found that those mantles which made the best show at first did not last well. The lowest gas consumption recorded for such burners was 1·1 litres per hour per Hefner unit; but after 100 hours the consumption rose to 1·6 litres per unit.

Sampling Coals by Rontgen Rays.

The suggestion has been offered by Mr. Caryl D. Haskins to the North-Western Electrical Association of America, that it might be possible to utilize the Röntgen rays for making rough tests of the quality of samples of coals. His idea was that the density of the shadow of a sample viewed by the fluoroscope would be dependent upon the proportion of ash in its composition. Hence by matching the shadow of a sample to be tested with that of a standard sample, it would be possible to assign the former to its grade in comparison with the latter. The suggestion is ingenious; but unfortunately no information is forthcoming as to whether or not the correctness of the hypothesis upon which it rests has been determined by direct experiments. In any case, great care would be required for the preparation of the samples of coal to be tested in this manner, in order that the exploring radiations should traverse equal thicknesses of matter in every instance. Even so, a sprinkling of pyrites more or less would probably upset the examination, which in other respects seems to savour rather of the methods of Laputa than to correspond with the exigencies of fuel users.

Forced and Suction Draught.

It appears from some observations communicated by Mr. M. Paul, of Dumbarton, to the Institution of Engineers and Shipbuilders in Scotland, that when forced or assisted draught was to be resorted to for increasing the consumption of fuel, and consequently the duty of a boiler furnace, there is a remarkable superiority in suction as compared with blowing. Practice with several varieties of boilers and furnaces was cited in support of this conclusion, for which no entirely satisfactory explanation has yet been offered. It is evident that for the same consumption of fuel per unit of firegrate surface, with the same proportionate air supply, the temperature and volume of the furnace gases, and their speed at any given point of their passage to the chimney, must be the same whether combustion is accelerated by suction or pressure. The difference of pressure which causes the flow of the hot gases must be the same at any given point, whether the difference is produced by forming a plenum before the furnace or a partial vacuum after it. In the one case there is atmospheric pressure at the exit, and a plenum at the inlet; in the other, there is a partial vacuum at the exit, and atmospheric pressure at the inlet. Why there should be any difference of useful effect between these methods of operation does not appear; but the fact is stated as incontestable. In default of actual reasons, Mr. Paul was inclined to put the difference down to the credit of the general rule that persuasion is always more effective than coercion. "The Engineer," commenting upon this confession, argues that the disinclination of mankind to expect phenomena for which no antecedent reason is apparent, has profoundly affected the progress of events in the world's history. It is conceded that no one knows why suction draught should act differently from forced draught; and this ignorance of the principle has tended to make people ignore the fact. It is pointed out that there are other things in the working of furnaces that are not understood—as for instance, the way in which a wet ashpan saves the furnace bars of a very fierce fire. "How does the water save the bar? It is often said that it acts by quenching hot cinders; but this reason is lamentably inadequate. We are told again that it is the steam rising from the water that cools the bars. We are not ashamed to say that we do not know why it saves them." There is also the fact that bars will burn or melt if they are sloped to the back of the furnace, and will stand very well if placed horizontally—why, nobody seems to know.

The Composition of Good Mortar.

Mr. John Hughes has communicated to the "Builder" the results of a chemical examination of some of the mortar taken from the condemned portion of the West Front of Peterborough Cathedral. Two samples of it were obtained, both soft, easily broken, and evidently of poor quality. Upon analyzing them, it was found that the actual percentage of lime was high; but this was largely due to the calcareous nature of the small stones and gravel present. This was essentially an instance in which the high proportion of lime was no indication of the quality of the mortar. There was an unusually large amount of iron oxide present, indicative of the soft and ferruginous nature of the sand and gravel; while there was a great deficiency of soluble silica, or silica in the form of silicate soluble in a 10 per cent. solution of caustic soda. It is silica in this condition that constitutes the important element in cement; and according to Mr. Hughes's investigations, it is the respective richness in soluble silica that constitutes the chief difference in the quality of certain kinds of lime for building purposes. Thus chalk lime contains only 1 or 2 per cent. of soluble silica; greystone, 9 to 10 per cent.; Aberthaw, 15 per cent.; while the best portland cement contains as much as 20 to 22 per cent. Old mortars taken from a number of castles and abbeys show a difference in content of soluble silica of from 1·60 per cent. in the case of Rochester, and 3·55 per cent. in that of Peterborough, to 9·85 per cent. at Caerphilly. The Rochester mortar is notoriously bad; and it now appears that the Peterborough mortar closely resembles it.

TECHNICAL RECORD.

OHIO (U.S.A.) GASLIGHT ASSOCIATION.

Annual Meeting in New York.

(*Concluded from p.* 588.)

Mr. Irvin Butterworth, of Columbus (Ohio), read a paper describing an accident to a small gasholder, at a private gasworks near his district. The holder was a single-lift one, 36 feet diameter by 14 feet deep, with brick tank, and five columns and girders, situated at the foot of a hill. One afternoon in May, about 3 o'clock, a large forest tree, overturned by wind, fell across one edge of the holder, which was nearly full, breaking down the guide-framing, and tilting the opposite side of the holder over the edge of the tank; also tearing a small hole in the crown. The gas escaped from under the tilted side. Within a few hours, arrangements were made for replacing the holder and erecting a temporary wooden guide-frame. The inlet and outlet were sealed; and to expedite the work, three large oil-lamps were placed at distances of 10 to 15 feet from the curb, on posts 10 feet high. Work was continued for some hours after lighting the lamps; and all smell of gas had disappeared. But about 1 o'clock, while lifting the lower side with the aid of a crane, and trying to ease off the part resting on the curb, by removing the top portion of the tank with crowbars, an explosion occurred; and a large blast of flame issued from inside the holder, under the raised edge, with such force as to throw the six men working there prostrate to the ground. So far as could be gathered, three distinct concussions closely followed each other. The noise awoke neighbouring residents; and one man died from the effect of his injuries. The holder was not injured, but was shifted from the hooks attached to the lower side for lifting. Grass, &c., to a distance of 75 feet from the holder was perceptibly scorched. It was a surprising thing that an explosive mixture should have been retained in the holder for so many hours; and the fact did not agree with the general notions as to the diffusibility of gases. The lanterns were not shattered or extinguished; and it was not supposed that they caused the explosion.

Discussion being invited, Mr. Miller thought there must have been an accumulation of light oils inside the holder on the surface of the water, and that these were responsible for the explosive mixture. Mr. Sherman related a case of a holder that had been out of use for three years, and left with the manhole lid off. A boy carelessly threw in a lighted match; and an explosion followed which wrecked the holder. Mr. Coombs had known an explosion to occur after a holder had been left open for two weeks. Mr. Whysall remarked that, with natural gas, a deposit was formed in the pipes and fittings that took fire when exposed to the air. Mr. Philipp said that if the atmosphere was moist, as was usually the case after a storm, the diffusion would not be so rapid as when it was dry.

A paper on "Advertising" was read by Mr. E. S. Templeton, of Ashtabula (Ohio). After pointing out the general advantages

of advertising, the author said that the gas business was one that would justify every intelligent effort to extend the output. The fixed establishment expenses being the same, it followed that additional business was an element of economy in working. Besides advertising in the local newspapers, pamphlets or circulars could be issued to probable consumers; but it was no use to do this unless prepared to follow it up with a good service at a fair price. There should be no exaggeration or over-statements; and the advertisement should be attractive. Something might be done by gas companies combining together to get up the best possible things in this way, as it was a costly matter to prepare special illustrations, &c. There must also be persistent effort, with not only personal letters but personal interviews—as instanced by the effective way in which party politicians worked for their candidates. He concluded with some suggestions for compiling a register showing the name of every probable customer in the district.

Mr. Doherty strongly supported the arguments advanced in the paper, and urged that money spent in giving stoves away, fixing gratis, &c., would be used to much better advantage if expended in judicious advertising. He ran permanent advertisements in the local press, varied according to the season or the time of year; and he also used a register similar to that suggested, with great advantage. Any concern sending out 10 million cubic feet of gas per annum or more, would do well to employ a salesman exclusively for extending the demand for gas; and in larger districts, there should be sections each in charge of one man, who should know what lighting agent was used in every house. Mr. Miller thought it did not necessarily follow that an article must be good and cheap in order to sell. He emphasized the importance of keeping on good terms with the newspapers, which could best be done by regular advertising. He believed there was a firm in the city who would furnish the kind of advertising matter indicated in the paper. By advertising and house-to-house canvassing, he had increased from 1400 to 3200 meters within two years.

The question-box was then opened; and a special feature of this department was that several of the replies were taken as "not for publication." In the course of a discussion on the best paint for gasholders, Mr. Thompson mentioned that the addition of a little paraffin to boiled tar was a great improvement; but a holder that was once tarred could not be painted. The meeting next proceeded to elect officers for the ensuing year. A memorial minute to the late Mr. J. R. Thomas was unanimously carried by a rising vote; and it was decided that the next meeting should be held at Cleveland (Ohio). In the usual votes of thanks, special recognition was made of the courtesies extended to the Association by Mr. E. C. Brown and the Gas Industries Company.

The proceedings then closed.

OBSERVATIONS ON CARBURETTED WATER GAS.

By J. T. Westcott, M.E.

[A Paper written by request for the Civil and Mechanical Engineers' Society, and read last Thursday.]

No one can be indifferent to the development of the gas industry, which, within the past few years, has increased to so great an extent that at the present time, in the amount of capital invested, with the exception of railways, it is second to no other industry. Since Murdoch, the recognized "Father of gas lighting," first lighted his house in 1793, gas has been manufactured from coal, rosin, wood, oil, coke, steam, calcium carbide, and water; and has also been discovered, and used very extensively, in the natural state. When found in the latter form, it has proved very valuable for fuel purposes; the burning of one cubic foot giving about 225 British thermal units more than can be obtained from the same quantity of 18-candle power coal gas. Usually the terms coal gas, carburetted water gas, water gas, or producer gas, are simply intended to convey a commercial idea, without any technical meaning; and owing to this fact, much misunderstanding has arisen, causing discussions which have misled and prejudiced the public. The term "carburetted water gas" conveys to the people of Great Britain the same meaning that the term "water gas" does to the American mind.

Different Kinds of Commercial Gas.

Coal gas is manufactured by placing bituminous coal in air-tight retorts, and subjecting these to a high degree of temperature; thereby expanding the gas contained in the coal, and forcing it out. After leaving the retort, it is condensed, scrubbed, purified, &c., before being used by the consumer.

Producer gas is made by passing air, or air and steam together, through incandescent fuel contained in a furnace producer or generator; the highly heated carbon of the fuel uniting with the oxygen of the air and steam, and forming producer gas, which is composed of carbonic oxide, hydrogen, nitrogen, and certain impurities, chief of which is carbonic acid. This gas, as we find it manufactured by the Dowson producer, is used principally in factories for fuel purposes. Compared by measure with other gases, it gives, when burning, a low illuminating and heating power; but, when compared by weight, it burns with a high temperature and low illuminating power.

Water gas is formed in nearly the same manner as producer gas, with the exception that steam alone is passed through the incandescent fuel bed. The resultant gas is composed of carbonic oxide and hydrogen, $2CO + 2H_2$, and some impurities.

Carburetted water gas is as different from water gas as day is from night. After making the straight water gas just described, it is passed over a large surface of highly heated refractory material, in conjunction with oils containing hydrocarbons, which are first vaporized and then gasified, and form a chemical composition with the water gas. The new gas thus formed is called carburetted water gas. It is the apparatus for manufacturing this particular form of gas which will occupy our attention this evening.

History of Carburetted Water Gas.

It is most interesting to note the development and evolution of carburetted water gas, from its earliest inception. About 1784, Cavendish made the discovery that hydrogen—which had been known before as "inflammable air"—was one of the component parts of water, and at the time it was looked upon as very astonishing. Some while before this, Fontana pointed out that gas could be manufactured by the decomposition of water, in passing it over ignited iron and coal. The theories set forth by these scientists, seem not to have been put into actual practice until about 1824, when J. H. Ibbetson took out a patent for a special method of making an illuminating gas by passing steam through a mass of incandescent carbon.

From this time down to 1860, quite a number of different patents were taken out, reaching a total of sixty or more. During this period, however, no apparatus was designed that gave commercial success. It is interesting to note that some of these early patents contained features which are found in our modern successful settings. It is not my intention to deal with the many patents which have been taken out to the present day, as their number is almost legion, or to consider in detail some thirty different types of plant which have been built and put into successful operation. These can be divided into two general classes. Class I., retort processes, or those in which the steam is admitted into retorts containing carbon, the temperature of which is maintained by combustion external to the retorts—such as the Sanders apparatus, the Allen-Harris, and others; Class II., generator processes, or those in which the steam is admitted into retorts and furnaces, or generators, containing carbon which has been previously heated by partial combustion of its own mass or by internal combustion.

The latter class can be divided into two sections: (1) The generator processes, in which a non-luminous water gas is first made, which is afterwards carburetted, usually in a second apparatus, by a second fire, and in a second operation—such as the Tessié du Motay, the Wilkinson, the Jerzmanowski, and other apparatus. (2) The generator processes, in which an illuminating water gas is made, carburetted and fixed entirely in one operation, one apparatus, and with one fire, usually through the medium of a superheater—such as the Lowe, the Granger, and the Hanlon-Leadley apparatus, and the two types found in Europe—the double superheater and the Merrifield-Westcott-Pearson apparatus.

Professor T. S. C. Lowe is unquestionably the man who has received the credit of inventing the process which is the basis of the present successful commercial water-gas plant. The first Lowe apparatus was erected in Phœnixville, Pennsylvania, in 1873. After this, for several years the Lowe apparatus was built by different firms, who obtained licences from Professor Lowe, down to about 1885, when the Granger Water-Gas Company were consolidated with the United Gas Improvement Company. Notwithstanding these various processes, patents, &c., at the present day we find in England only two distinct types—namely, the so-called double superheater process, an example of which is the The Gaslight and Coke Company's installation of 10 million cubic feet daily capacity, the first sets of which were erected by the United Gas Improvement Company, of Philadelphia. Another example of this class may be seen at Belfast, and still another at Hornsey, each of which was erected by a different firm.

The first double superheater setting for the manufacture of carburetted water gas was erected at Coney Island, U.S.A., in the spring of 1882, and was designed by A. O. Granger and Co. The generator was 6 feet in diameter by 12 ft. 3 in. high; the carburetter, 6 feet in diameter by 13 feet high; and the superheater, 6 feet diameter by 22 feet high. It was originally designed to be worked with superheated steam. The generators were to be connected at the bottom; and the oil was admitted at the top of the carburetter by an injector, the necessary force being obtained by a pump under pressure. The consumption of gas being too small, the plant was never operated as designed; one set only being used in the ordinary manner. The Constructing Engineer for the contractors was our Chief Engineer, Mr. L. L. Merrifield. The patent for the first double superheater apparatus was taken out in the United States by A. O. Granger and J. H. Collins, jun., and was known as a "Process of, and apparatus for, manufacturing gas," patent No. 287,277, granted Oct. 23, 1883; application filed March 10 same year.

This type of plant consists of three steel shells. The first is known as the generator, and is connected from the top to the upper part of the second shell, which is called the carburetter; and this is connected at the bottom to the lower part of the third

shell, which is known as the superheater, and is usually higher than the first two. Each shell contains a fire-brick lining about 12 inches in thickness, at the back of which is a filling-in material of asbestos fibre, or some good non-conducting substance about 2 inches in thickness; on the outside being the steel shell. A branch on the top of the generator admits the coke, which is supported by grate-bars at the bottom; and under these bars is a conical-shaped hopper, sealed by means of a valve to make it gas-tight. The other two shells, in addition to the fire-brick lining, are filled with a checkerwork of common fire-brick, supported on arches or tiles. At the top of the superheater is a branch and stack valve, which regulates the flow of the gases from the apparatus. One reason for first building this style of plant was to adapt it to the low roofs of retort-houses then in use. Its rapid progress in the United States was owing to the United Gas Improvement Company controlling the Lowe patents, and for commercial reasons introducing it, without practically any competition with any other form of plant; whereas, in Canada, where different conditions exist, there have been five of some form of the combined type erected for every one of the double superheater type.

It is worthy of note that some of the people who have had large experience with this type of plant have discarded it for the second type—viz., the Merrifield-Westcott-Pearson apparatus—which is now being introduced into Great Britain by the Economical Gas Apparatus Construction Company, and embodies the latest development in the evolution of carburetted water-gas plants. Parties who are very good as writers and theorists have tried to demonstrate theoretically that the old style of plant should be adhered to—possibly because the new one is covered by patents. The reason for abandoning this plant was owing to its inability to deal efficiently with the gasification of all grades of oil, especially the heavier ones found in Canada and England. For best practical results, this oil requires a low heat, which the double superheater fails to give, owing to the oil first coming in contact with either the brickwork or square iron bars at the top—*i.e.*, the hottest part of the carburetter, caused by the radiated heat from the generator and the producer gas continuously burning at this point when blowing up the heats. In practice, it is found impossible to keep this heat at the low point required for the best distillation of the oil; the high heat causing a large percentage of lamp-black. Its thorough mixture with the straight water gas is retarded by both passing down through the carburetter.

At times the oil disintegrates the brickwork, and destroys the steel shell at the bottom. Practically the only part of the apparatus that acts as an efficient gasifier for the oil is the superheater. When blowing up the heats, dust and small particles of coke are frequently carried from the generator into the refractory material of the carburetter, rendering it inefficient and requiring it to be renewed at an early date. The oil-heater, being placed between the outlet of the superheater and washer, soon clogs up, owing to a deposit of lamp-black. The great percentage of carbonic acid which is made in the generator, places a very heavy amount of work upon the purifiers. The floor-space and distance between the valves gives the gas maker unnecessary work. The connections between the generator and carburetter are practically a return to an obsolete and discarded form of plant, known as the goose-neck connection.

The practical and theoretical experience gained by men who have had as much, if not more, experience than any others, has overcome many of the above objectionable features by designing and building the newest type of plant, which may be termed the combined form.

The Merrifield-Westcott-Pearson Setting.—Of the various types of the combined form of apparatus, there have been some 230 sets built. This particular type may be seen, among other places, at Blackburn and Birmingham; the latter plant when completed having a daily capacity of from 8 to 10 million cubic feet. It consists of two shells—(1) the generator, and (2) the superheater and fixing chamber—with direct connections between them, only 20 inches apart, having brickwork linings similar to that previously described in the double superheater type, with stack-valve, &c. The superheater is the lower part of the second chamber, and superheats the water gas before it comes in contact with the oil. The fixing chamber is the top part of the second shell. The superheater is filled with common fire-brick checker, supported upon tiles; and then there is a space between the top of the checkers to another arch above it, which is below the level of the working floor, where the oil is admitted. This space may be called the carburetting chamber. Directly above this is an arch supporting the checker-bricks of the fixing chamber where the straight water gas and oil are literally cooked into a permanent gas. When blowing up the heats, the air is admitted into this second vessel at two different points; and they are so nicely adjusted that almost any temperature at any part of the apparatus can be obtained at the will of the operator—thus ensuring the most efficient and best results from the oil, giving them the different heats that may be required for any grade of oil in use, and admitting the oil to the coolest part of the apparatus. The oil, forced downward through the atomizers, impinges the straight water gas as it ascends, causing the two to mix in the most thorough manner, and thus preventing the undesirable collection of oil on the bricks, which would be burnt out when blowing up the heats. The brickwork is kept clean, and in most efficient working order, by passing all foreign matter that may blow over from the generator to the bottom of the superheater, where it is taken out from time to time through a manhole, and never allowed to come in contact with the brickwork. The parts are so nicely adjusted that practically no lamp-black is made; thus ensuring better illuminating results. The water in the washer is always kept at a high temperature, in order to prevent sudden cooling of the gas. The generator is specially arranged to give several different zones of heat, so as to keep down the amount of carbonic acid.

Method of Operation.—A fire is started in the generator, which is filled up with coke. A blower is started by means of an engine, making a forced draught into the fire at the bottom of the generator; the main being regulated by a valve. The coke becomes hot, which gives it a strong tendency to unite with the oxygen of the air, forming producer gas—that is, carbonic oxide and nitrogen are set free. These two gases pass out at the top of the generator down to the bottom of the superheater; and as they are only partial products of combustion (the meaning of which is that if more oxygen is added while they are in a heated state, they will ignite and burn), air is admitted at this point, regulated by a valve controlling the amount supplied from the fan, and the carbon from the carbon monoxide grasps the oxygen of the air, forming some carbonic acid, and leaving some carbonic oxide and nitrogen. The amount is varied according to the heat required. These gases pass on up through the superheater and carburetting space to the fixing chamber, where another valve is opened and admits air to the fixing chamber, the oxygen of which unites with the remaining carbonic oxide and forms carbonic acid; setting a further amount of nitrogen free. With the absorption of this large amount of oxygen from the air, heat results. The coke becomes heated; and, the carbonic oxide absorbing the oxygen in the superheater and fixing chamber, there is an intense heat, which is absorbed by the series of loose fire-bricks with which the superheater and fixing chamber are filled. These are the products of complete combustion, which pass up through the stack-valve to the atmosphere. As soon as we have obtained sufficient heat for the decomposition of steam in the generator, and the best heats in the right places in the superheater and fixing chamber, we discontinue the process of blowing up the heat which has just been described, and commence

Making a Run of Gas.—The air-blast is shut off from the fixing chamber and superheater and generator, and combustion ceases. The stack-valve is closed, and steam is admitted under the grate-bars of the generator; the highly heated carbon of the coke decomposing the steam by uniting with the oxygen and setting the hydrogen free, forming theoretically $2CO + 2H_2$. In practice, however, there are some impurities and a certain amount of carbonic acid. These two gases form what is known as straight water gas, and will burn with a pale blue light. The illuminating power is produced by the oil being forced through the atomizers as before described. As the water gas passes up through the superheater, the oil is vaporized and gasified, and the two gases thoroughly mixed; and it passes up through the hot fire-brick of the fixing chamber, and forms a thoroughly fixed permanent high candle-power gas, known as carburetted water gas. From here it passes on through the washer and oil heater, where the otherwise wasted heat is taken up by the oil which is passing in an opposite direction to the gas through a coil. From here the gas flows on through the scrubbers, condensers, purifiers, &c. When it is time to stop the run of gas making, the oil and steam valves are closed, and the stack-valve opened.

Making a Down-Run.—To again regain the heats, we proceed in like manner as previously described. When all is ready to make the down run of gas, we close the air-valves and stack-valves; and simultaneously shut the valve regulating the upper outlet of the generator, and open the valve regulating the outlet at the bottom of the generator. Steam is now admitted at the top of the generator, and passes down through the fire on over into the bottom of the superheater; the same chemical reactions taking place in the formation of the water gas in the generator as previously described. After this the water gas is passed on, and comes in contact with the oil in the same manner as with an up-run. The same chemical reaction will be taking place in the formation of carburetted water gas as has already been described. Frequently we make five-minute blows and seven-minute runs.

Analyses.—The following is an analysis of the unpurified gas from the Blackburn plant on this system. Candle power, 22·7.

	Per Cent.
Sulphuretted hydrogen	0·6
Carbonic acid	2·8
Unsaturated hydrocarbons	10·3
Oxygen	0·1
Carbonic oxide	27·1
Saturated hydrocarbons	22·3
Hydrogen	29·4
Nitrogen (by difference)	7·4

The following is an analysis of the purified gas taken from the same plant at another time. Candle power, 21·37.

Carbonic acid	—
Oxygen	—
Olefines, &c.	13·9
Marsh gas, &c.	26·2
Carbonic oxide	22·7
Hydrogen	32·8
Nitrogen	4·4
Density	0·592

In order to show the analogy of this gas with coal gas, I append the following analysis of coal gas, taken from the Minutes of Proceedings of the Institution of Civil Engineers, Vol. LXXIII., p. 320 :—

	Per Cent.
Carbonic acid	—
Oxygen	0·08
Olefiant gas	3·53
Marsh gas	35·25
Carbonic oxide	8·95
Hydrogen	51·81
Nitrogen	0·38
Density	0·458

From these analyses, it will be observed that coal gas and carburetted water gas, though made by two totally different processes, in the finished product are analogous.

Rapid Increase of Water Gas in America.

Notwithstanding the legal and technical contentions that have taken place in America, and almost everything possible done to prohibit the manufacture of carburetted water gas, still within the past twenty years it has increased so rapidly that at the present time 70 per cent. of all the gas made is carburetted water gas; leaving only 30 per cent. of coal gas. In many leading towns—Chicago, Boston, and other places—it is consumed in its pure state, without being mixed with coal gas.

Scientific Opinions.

It will be unnecessary for me to quote the opinion of the leading scientists the world over on the advisability of the use of carburetted water gas, further than the following from Dr. Crum Brown, Professor of Chemistry at the University of Edinburgh. After comparing the two gases, he concludes by stating: "The increased amount of carbonic oxide is therefore no real objection to the introduction of carburetted water gas for illuminating purposes in place of coal gas;" and Dr. E. Frankland, formerly Gas Examiner of London, writes from the Royal College of Chemistry, South Kensington, London, dated May 16, 1878, as follows :—

In compliance with your request, I have read the reports of Dr. Henry Wurtz, dated Jan. 1, 1878, and March 4, 1878, on the composition and properties of the gas of the Municipal Gaslight Company of New York, and also the articles published by Professor Henry Morton in the "American Gaslight Journal" of March 2 and 16, 1878; and having been called upon to express my opinion as to the adaptability of water gas for lighting and heating purposes, I have no hesitation in saying that it may be used with safety, both in public buildings and in private houses. I should be delighted to substitute this pure and powerful illuminating agent for the gas with which my house in London is at present supplied, although it is used in all the bed-rooms.

It would seem that many people when comparing the two gases forget that the cause of a person dying from asphyxiation is want of oxygen; and when they have been compelled to breathe marsh gas or carbonic oxide, that the microscopical examination of the corpuscles of the blood from the effect of either is the same. It would seem that, though there is a greater amount of carbonic oxide in carburetted water gas than in coal gas, yet in coal gas there is a much larger amount of marsh gas than is found in carburetted water gas—the one off-setting the other in its ill-effects. The general conclusion where this gas has been extensively used, is that for illuminating purposes the one is no more dangerous than the other.

Use of Carburetted Water Gas.

As an Enricher.—The rapid increase in the amount of carburetted water gas consumed in America, is owing greatly to its enriching value, and to the fact that a gas of 30 candles can be made and used in its pure state. This was found necessary in order to compete with the electric light. As an enricher, it is one of the best, if not the best, known. A high candle-power gas can be made proportionately at less cost than low candle-power gas. For instance, the amount of labour and coke required per 1000 cubic feet to manufacture a 16-candle gas is precisely the same as that needed for the manufacture of a 30-candle gas; the only extra cost being the additional amount of oil required.

Clogging of Burners.—Some trouble has been experienced from the clogging of burners when using this form of gas. The same is also true of coal gas, and is only found when either gas is not thoroughly purified or condensed. With proper precautions, there is never any trouble whatever from the clogging of burners.

Gas-Engines and Heating Purposes.—Carburetted water gas when burning gives off about 5 per cent. less heat than coal gas of the same candle power. This difference is usually counteracted by making a higher candle power carburetted water gas than is generally made when manufacturing coal gas. There is no trouble from its use for power purposes in gas-engines, or for cooking and heating purposes in stoves. Perfect satisfaction can be obtained from perfect combustion, which is attained by regulating the amount of air supplied to the gas; carburetted water gas requiring a little less air than coal gas.

Cost of Manufacture.—A paper written by the Blackburn Corporation Engineer, and read before the Manchester District Institution of Gas Engineers,* gives the amount of raw material required for 1000 cubic feet of carburetted water gas as shown in the next table.

Gas made	5,129,000 cub. ft.
Oil used	16,773 galls.
" " per 1000 cubic feet	3·26 "
Coke used (generator and boiler)	188,113 lbs.
" " " " " per 1000 cubic feet	36·70 "
Illuminating power	23·24 candles.
" " per gallon	7·10 "

This was the actual average working of one section of the plant from Oct. 23 to Nov. 13, 1895. In addition to the cost of raw material, the wages per 1000 cubic feet for the same time averaged 0·77d.

Thermal Value.—When we consider this type of plant from a thermal standpoint as a heat engine from actual tests, it stands among the first; and with the gradual evolution that is taking place, each year is adding to its efficiency thermally, and also as a chemical apparatus.

Advantages of Carburetted Water Gas.

These are so well understood that only a reference will be necessary :—

1.—The small ground space required; about 2,500,000 cubic feet of carburetted water gas being manufactured in the space required for 600,000 cubic feet of coal gas.
2.—Its immediate availability. Without injury, a cold plant can be making gas within four hours from the time of firing the generator.
3.—Saving in capital account.
4.—Control of the coke market.
5.—Candle power increased or decreased instantly.
6.—Assistance in times of strikes; one man making the same amount of gas as eight or ten men in a coal-gas works.
7.—Assistance in case of dearth in coal supply, by making use of coke.
8.—Destroys and prevents naphthalene deposits.
9.—Reduces the cost of the manufacture of coal gas.
10.—Saving in repairs and maintenance.

That these advantages have been appreciated is demonstrated in America by the amount of carburetted water gas used, and in Europe by its adoption at the works of many of the leading engineers. In every place the advisability of adopting carburetted water gas must be determined by the peculiar local condition. From personal experience, the ideal plant is that which combines both coal and carburetted water gas.

DETERMINING THE GAS-MAKING VALUE OF MINERAL OILS.

The following is an abstract translation of a communication made by Dr. F. Helfers, of the Laboratory of the Actien-Gesellschaft of Saxony-Thuringia, to the "Zeitschrift für Angewandte Chemie."

Gas oils have hitherto been commercially tested for their colour, specific gravity, creosote content, and boiling-point; but these properties are not reliable criteria of gas-making value. The gasification test is difficult of execution, and generally inexact; but experimental works, requiring from 2·5 to 40 gallons of oil for each test, have been erected for giving rapid and accurate results. Such works are too elaborate and costly for use by every consumer of gas oil. Fortunately, the difficulty may be overcome by the use of Wernecke's laboratory gas-making apparatus, which gives correct results from the gasification of 1·4 oz. of oil.

The apparatus consists of an asbestos-lined furnace, standing on adjustable legs so that it may always be brought into a vertical position. There is near its top a circle of holes; and there are also two perforations, the lower of which serves for igniting the flame, while the upper is closed by a disc of mica through which the retort may be observed. The bunsen burner for heating the retort is introduced in the centre of the furnace by means of a plate on the bottom of the cylindrical shell of the furnace. The top of the retort projects above the furnace, and has two socket-pieces, one of which receives the ascension-pipe, and the other the feeding apparatus. The latter passes into the retort, and ends close to the top of a distributing bell. The feeding apparatus consists of a U-tube, of which one arm is attached to a glass cylinder, and the other to the tube which passes into the retort. The latter tube is constructed to act as a valve by means of a needle passing through a stuffing-box at the upper end, and entering a choke at the lower end of the tube. This arrangement serves to shut off completely the inflowing oil, and to facilitate exact weighing of the oil unconsumed. It also makes observation of the pressure in the retort possible. The tube conveying the gas from the retort has its mouth beneath the oil-distributing bell, which is supported by a projection from the interior wall of the retort. The oil drops on to the bell, and is thus sprayed uniformly on the walls, and gasified as it descends. In order to avoid stoppages, or to remove them without interfering with the test, a rod with scrapers attached passes through a stuffing-box in the retort-lid. The gas and tar vapours pass from the retort to a cylindrical receiver with a conical base terminating in a relief-cock, and thence to the tar-separator, which is packed with corrugated wire gauze. In the exit-tube of the tar-separator are two glass bulbs, and the condensing surface may be increased by packing these with glass wool. The gas then passes into a holder of the floating bell type, and thence to an experimental meter and photometer.

* See "Journal," Vol, LXVI., p. 1141; Vol. LXVII., p. 460.

A dropping funnel with glass rod is filled with the oil to be tested. There are then weighed (1) the dropping funnel and feeding apparatus, (2) the retort, and (3) the receiver and tar-separator. The funnel is inserted in the feeding apparatus, and the retort is heated by the burner, the flame from which shows at the circle of holes near the top of the furnace. When the retort is at a bright red heat, the admission-valve is opened to its full extent, and the rod of the funnel is turned so that the oil drops slowly from it. The colour of the gas and tar must be observed in order to judge if the production of gas is going on normally. If so, the gas should be brown and the tar dark. If the gas is white and the tar light brown, the flow of oil is too great, and gasification is incomplete. If the gas is very dark brown and the tar viscid, more oil should be admitted. The number of drops of oil per minute which give normal gasification should be ascertained by a preliminary test; and the correct flow of oil can then be uniformly maintained in the actual test. For various kinds of oil and different heats, it will range from 10 to 30 drops per minute. The column of oil in the glass cylinder should be kept approximately at the same height throughout; and the pressure is then regulated by weighting the gasholder bell.

At the close of the test, the funnel and the admission-valve are shut off. The valve in the exit-pipe is closed, and the jet at the burner extinguished. The gas is left to mix and cool in the holder. Its volume is then read off; and it is tested by the photometer. The funnel and feeding apparatus are once again weighed; and the difference between this and their former weight gives the weight of oil gasified. Similarly the increase in the weight of the retort shows the amount of coke made; and the addition to the weight of the receiver and tar-collector gives the quantity of tar produced. These are calculated into percentages by weight of the oil taken.

The illuminating value of oil has hitherto been ascertained by Hirzel's formula, according to which the lighting value of 100 kilos. (220·46 lbs.) of oil is equal to the yield of gas from 100 kilos. multiplied by the candle power in German standard candles, and the product divided by 35—this figure signifying an hourly gas consumption of 35 litres (1·236 cubic feet). This formula only gives concordant results if the yield of gas does not greatly vary. But if in one case 50,000 litres and in another 60,000 litres of gas per 100 kilos. of oil are made (or 17,940 and 21,530 cubic feet per ton), it furnishes a result in the latter case lower by 50 per cent. than in the former, because the candle power increases or decreases in greater proportion than is demanded by the formula.

It was thought that by the assistance of some factor there would result, from the different yields of gas and the candle power appertaining to each, a uniform candle power for the same oil, if this were reckoned on an assumed average yield of gas. From a series of trials of gas making from the same oil at varying temperatures and rates of flow, a ratio was discovered, and was confirmed by a great number of trials with different oils. The German standard candle was the photometric standard used; and the gas was burnt at the rate of 35 litres per hour.

Let A = the actual yield of gas from 100 kilos. of oil, expressed in cubic metres.
L = the candle power at the above rate of consumption, &c., of the gas made.
L_{50} = the candle power calculated for an assumed average yield of gas of 50 cubic metres per 100 kilos. of oil.
C = the coke produced in percentages of the oil used.
T = the tar " " "
Then C + T = the total percentage of residue from the oil.
Let Z = L_{50} − L, or the difference between the actual candle power and that calculated for the average yield of gas.

Then the ratio observed was—

$$Z : A - 50 :: C + T : 100$$

where 50 represents the assumed average yield in cubic metres. Z is the only unknown factor; therefore—

$$Z = \frac{(A - 50)\ (C + T)}{100}$$

But $Z = L_{50} - L$; therefore—

$$L_{50} = L + \frac{(A - 50)\ (C + T)}{100}$$

This equation therefore gives the candle-power of the gas for an average yield of 50 cubic metres from 100 kilos. of oil, provided the actual yield and corresponding candle power, and also the percentage of residue, are known. If the weight of a cubic metre of the gas is ascertained, and multiplied by the number of cubic metres made, the product deducted from 100 gives the percentage of residue; and the coke and tar need not actually be weighed. The results of tests conducted by four observers are given in Table I.; and they show the concordance which is attained by the use of the formula. Two comparative tests were made with Wernecke's apparatus and large-scale apparatus, to ascertain if the results were in harmony. These, and their equivalents in English terms, are given in Table II.

TABLE I.

——	Dr. Henrici.	Dr. Diamant.		Dr. Eisenlohr.					Dr. Helfers.
Yield of gas in cubic metres per 100 kilos. of oil	55 70	63 36	54·23	58·90	54·72	59·09	61·10	48·55	54·93	57·17
* Do. in cubic feet per ton of oil	19,988	22,736	19,460	21,135	19,636	21,204	21,925	17,422	19,711	20,515
Candle power in German standard candles, with a consumption of 35 litres per hour	9·00	5·50	9·50	7·30	9·50	6·60	6·50	12·00	9·20	8·25
* Do. in English sperm candles, with a consumption of 5 cubic feet per hour	38·22	23·36	40·35	31·00	40·35	28·03	27·60	50·96	39 07	35·04
Coke, percentage by weight	7·37	9·64	5·51	8·70	5·15	9·20	9·56	3·84	5·85	6·69
Tar " "	41·83	35·15	41·63	37·60	39·95	40·11	36·38	42·88	38·07	40·60
Candle power in German standard candles, with a consumption of 35 litres per hour, deduced by above formula for a yield of 50 cubic metres of gas per 100 kilos. of oil (17,940 cubic feet per ton) = L_{50}	11·46	11·48	11·54	11·42	11·62	11·08	11·59	11·40	11·35	11·64
* L_{50}, calculated to English sperm candles, and a consumption of 5 cubic feet of gas per hour	48·67	48·76	49·01	48·50	49·35	47·06	49·22	48·42	48·20	49·44

TABLE II.

——	Large-Scale Apparatus I.		Large-Scale Apparatus II.	Wernecke's Apparatus.	
Yield of gas in cubic metres per 100 kilos. of oil	52·00	53·00	60·63	59·90	65·05
*Do. in cubic feet per ton of oil	18,660	19,019	21,757	21,495	23,343
Candle power in German standard candles with a consumption of 35 litres per hour	10·00	9·17	6·70	6·50	5·00
*Do. in English sperm candles, with a consumption of 5 cubic feet per hour	42·47	38·91	28·46	27·61	21·24
L_{50} in German candles	10·96	10·58	10·89	10·47	10·26
*L_{50} in English candles	46·55	44·93	46·25	44·47	43·57
Yield of gas in cubic metres per 100 kilos. of oil	52·00	55·00	61·21	56·43	66·48
*Do. in cubic feet per ton of oil	18,660	19,736	21,965	20,250	23,856
Candle power in German standard candles, with a consumption of 35 litres per hour	9·17	8·33	6·20	8·50	5·50
*Do. in English candles, with a consumption of 5 cubic feet per hour	38·91	35·38	26·33	36·10	23·36
L_{50} in German candles	10·13	10·58	10·55	11·30	11·02
*L_{50} in English candles	43·02	44·93	44·81	47·99	46·80

* The figures in these lines do not occur in the original memoir, but have been calculated in each case from the figures immediately above them.—ED. J.G.L.

The formula can only be satisfactorily applied in cases where the gasification takes place normally; and it does not hold good for yields of less than 45 cubic metres per 100 kilos. (16,148 cubic feet per ton), or of more than 70 to 75 cubic metres per 100 kilos. (25,119 to 26,913 cubic feet per ton). It is unnecessary to make correction of the volume of the gas for variations in the barometric pressure, as such a correction would fall well within the limits of experimental error. Any correction for

temperature may be rendered unnecessary by always working at about 20° C. (68° Fahr.).

Oxidation of the retort causes only a small error. In a special case in which the empty retort was heated for two hours, it gained only 0·4 gramme in weight, and the increase in an actual gas-making trial would be considerably less. Condensation was very thorough, as after fifty tests only mere traces of tar were found in the pipe leading to the gasholder. The funnel and feeding apparatus were cleaned with the oil which was next to be used, and the tar-separator by means of a readily volatile oil, which was subsequently completely removed by drying.

THE SOURCE OF LIGHT IN FLAMES.

At the Royal Institution on Friday, the 12th inst., a lecture on this subject was delivered by Professor A. SMITHELLS, of the Yorkshire College, Leeds. It dealt with the general question of the luminosity of burning gases, and was not restricted to hydrocarbon flames.

Beginning with the flame of hydrogen, the lecturer said the question was raised: To what is the light of this flame due? The light has it origin in a vibration of molecules or atoms or electric charges thereon; and the interest lay in discovering to what substance the vibration pertained, and in what way it was set up. It was not sufficient to say that the chemical union of hydrogen and oxygen produced heat; and that the light of the flame was therefore due to hot steam. We should inquire for independent evidence of the ability of steam made glowing by the application of heat. No such evidence existed. None of the gases contained in ordinary flames could be made to glow by heat in the same sense that a solid glows. Iodine and bromine, and also, though in a less degree, chlorine emit light when heated in glass tubes. It was difficult to get any true picture of the act of chemical union. But it was at least certain that when hydrogen combined with oxygen, a large amount of energy previously latent or potential became kinetic; and it was impossible not to suppose that this would result in a vibratory state of the molecule being formed, that might well cause the emission of light. This vibratory state would, in origin, be quite independent of what was usually understood by temperature. A large amount of the motion would, no doubt, be expended subsequently in increasing the translatory motion of impinging molecules; and the temperature would therefore rise. But the rise of temperature would be a consequence, and not a cause, of the vibratory process. This doctrine would apply to flames in general—a particular kind of light would be associated with the formation of every particular product of combination. If the combustible ignited at a low temperature, the molecules might be spaced out by indifferent molecules to such an extent that the flame would show no appreciable rise of temperature to a thermometric instrument. Such a flame could be obtained by diluting the vapour of phosphorus with carbon dioxide. The flame so produced had a bright green colour, and to the touch seemed quite cold. A cold flame of hydrogen could not be obtained, because the temperature of ignition was high, and before the molecules had been much spaced out the general temperature fell below that point. It might be supposed that the hydrogen flame, being a hot shell of burning gas, might heat up some of the unburned gas within it to the temperature at which it would glow; but there was no evidence of this.

The question why the light of a hydrogen flame is so feeble was next raised; and reference was made to the general doctrines of Davy and Frankland. Davy's conclusion that all bright flames contained solid particles, had been undoubtedly upset by Frankland. There was, no doubt, strong evidence that the light of a flame was related to the molecular weight of the substances contained in it; but the lecturer did not consider that Frankland's general doctrine was established. In the case of flames made luminous by compression, the high density was obtained by molecular crowding; and a gas in this state was not comparable with one where high density was the mere consequence of high molecular weight.

Attention was then directed to the flame of hydrogen phosphide—the bright luminosity of which gave place to a green glow when the gas was diluted with carbon dioxide. The green glow was to be attributed to the act of formation of phosphoric oxide. The flame was cool; but as the supply of carbon dioxide was diminished, the general temperature increased, and the white glow appeared. The intrusion of a cold ring of wire, at once suppressed this part of the light; and it might be attributed, therefore, to a real temperature effect. The substance producing the white glow might be thought to be either phosphorus or phosphoric oxide. Since the introduction of oxygen increased this glow, it could hardly be due to phosphorus. This fact, together with the further one that the product of the green flame impinging on a bunsen flame held above it produces a white glow, seems to prove beyond all doubt that phosphoric oxide is the real agent. Two kinds of light, therefore, are obtainable from phosphoric oxide—the green glow during its formation, and the white glow due to direct increase of temperature; and in this way, the light of the flame of phosphorus and of hydrogen phosphide may be explained. The absence of solid particles from these flames could be shown by the optical test first applied by Soret.

The doctrine was then tested by reference to other flames. It was shown that silicon hydride on combustion exhibits silica in two states—one corresponding to that of phosphoric oxide, emitting green light, and the other to that of heated phosphoric oxide. The silica, however, soon assumes the state of solid particles in the flame. Similar observations were made with antimony hydride.

The phenomena of hydrocarbon flames are explainable on the same principles. The blue light at the lower and marginal part of such flames as ordinarily produced, is the light accompanying chemical combination. The bright yellow part is a secondary effect due to high temperature. This bright yellow part had been ascribed by Davy to solid particles of carbon, and by Frankland to dense hydrocarbon vapours. Soot condensed from a flame certainly contained hydrogen. A recent analysis had shown as much as 1·4 per cent. Among the hydrocarbons recognized by chemists, none contained less than 5 per cent. of hydrogen; so that, taking the most favourable view, the soot could not contain more than 30 per cent. of a hydrocarbon—leaving 70 per cent. of carbon uncombined. To maintain that the luminosity was mainly due to dense hydrocarbons, required, among many other difficult things, the recognition of soot as a unique hydrocarbon. The lecturer did not think that a good case could any longer be made for this theory. The question as to the physical state of the luminous substance appeared to be decided by the optical test. If this test were above suspicion, as it was generally admitted to be, there could be no question but that solid particles existed abundantly in the luminous region.

The precise cause of the separation and glow of the carbon had been the subject of an ingenious theory on the part of Professor Lewes, who considered it due to the formation and decomposition of acetylene. The author was not in agreement with Professor Lewes on the matter; but he reserved a further discussion of the question.

The light from the blue part of a hydrocarbon flame raised the question of the so-called candle-spectrum—a question which had aroused much controversy, and one of extraordinary interest. The phenomena of flames were consistent with the view that the spectrum in question was associated with the formation of carbon monoxide; and though this view was quite unorthodox, the lecturer expressed the opinion that the evidence in its favour was so great as to demand careful examination. Experiments with the cyanogen flame supported it. The view advocated by the lecturer—that, in the combustion of hydrocarbons, the carbon burns preferentially and forms carbon monoxide in the first instance—was placed almost beyond dispute by the researches of Professor Dixon.

In conclusion, reference was made to the luminosity due to the introduction of the vapour of salts into flames. The difficulty of getting definite information on this subject was alluded to, and experiments shown illustrating the method of investigation adopted by the lecturer.

RESEARCHES ON ACETYLENE.

The well-known German firm of Julius Pintsch have recently carried out a series of exhaustive researches on acetylene and its applications. A preliminary summary of the more important results has been given by the "Zeitschrift für Beleuchtungswesen;" and from it we gather the following particulars:—

The primary object of the researches was to ascertain if the dry gas, as has been generally stated, forms very explosive compounds with copper and copper alloys. Though conditions favourable to the formation of such compounds were artificially induced, the experiments quite failed to confirm the statements that they were thus produced. The poisonous properties of acetylene also were proved by repeated experiments to be very questionable; and it appeared that the gas was not in any case more dangerous than ordinary coal gas. But a point to which little importance was at first attached—viz., the dissociation and risk of explosion of acetylene by simple heating to 1435° Fahr.—seems now to be a serious obstacle to the general use of acetylene for lighting purposes. Experiments showed that acetylene holders, when strongly heated, either gave way at the points where they were soldered, and the gas was then ignited without explosion, or if they did not thus give way, an explosion of the gas ensued.

A further experiment was then made on the propagation of the dissociation of acetylene through services. A holder was charged with acetylene to 6 atmospheres, and put in connection with a pipe having a bore of 0·2 inch, and a length of 80 inches. At about 60 inches from the holder, the pipe was heated by a flame of water gas; and when it attained a red heat, an explosion resulted, and only small fragments of the holder remained. It thus appeared very hazardous to employ pure acetylene for lighting purposes, especially in railway carriages, for which it would have to be used in a state of compression. But, in order to ascertain if the high illuminating power of the gas could not by some means be made available for these purposes, further experiments were undertaken. It was found that acetylene was certainly dissociated when not in a state of compression; but the explosion was much less violent than under the conditions described above. The danger was lessened

by mixture of the acetylene with gas made from oil or coal. For instance, a mixture of 30 parts of acetylene with 70 parts of oil or coal gas would not be dangerous for railway carriage lighting, as by no rise of temperature would the gasholder be shattered. Even a mixture of 50 per cent. of acetylene with an equal quantity of oil gas is not dangerous in a holder fastened with soft solder. A mixture of acetylene with air is, of course, much more dangerous than the pure gas.

Acetylene added to the extent of only 20 per cent. to oil gas increased the illuminating power very greatly, even with the ordinary burners. Probably burners which would give much better results with such mixtures could be made. Even now economy might be effected by the use of this mixture in place of gas made from oil or fat only. The latter costs about 11s. 3d. per 1000 cubic feet, and gives one candle-hour for 0·0235d. Acetylene costs, at the present price of calcium carbide, about £2 16s. per 1000 cubic feet; and the 20 per cent. mixture would give one candle-hour for 0·0144d. A mixture of 50 per cent. of acetylene with a similar quantity of gas from oil or fat would yield one candle-hour for 0·02d. Therefore, with the existing lanterns and burners for lighting railway carriages by oil gas, the admixture of acetylene affords a means of effecting considerable economy, and with improved lamps any desired illuminating power could be obtained from mixtures of acetylene with the ordinary gas.

Similar results were obtained by adding acetylene to coal gas, though here the financial gain was less marked. Coal gas alone burns with a barely luminous blue flame in a small oil-gas burner; but if 30 per cent. of acetylene is mixed with it, a great rise in the illuminating power takes place, and it equals that of pure oil gas. With coal gas at 5s. 6d. per 1000 cubic feet, the mixture with 30 per cent. of acetylene gives one candle-hour at a cost of 0·0395d., which is higher than the figures quoted above for oil gas and mixtures of that gas and acetylene. But wherever coal gas is obtainable, there is only needed an acetylene generator and a compressing plant to enable railway carriage reservoirs to be re-charged with gas of equal efficiency to that specially made from oil or fat. The cost would be somewhat greater than that of the latter gas; but the existing lamps and fittings of the carriages would need no modification for use with the readily produced acetylene mixture.

Acetylene is not of any value for carburetting coal gas for town supplies, as, even at the most moderate price of calcium carbide, the low cost of light by the Welsbach system could not be approached. It has been found by experiment that, if dissociation of acetylene in services in a house is caused by fire, or by accidental heating of one of the pipes, the dissociation is not propagated to the gasholder from which the services are supplied with acetylene. There is no danger of an acetylene installation thus being destroyed by explosion.

The administrative department of the Prussian State Railway is about to take advantage of the results of these researches, and has erected works for the production of acetylene at the Grunewald station.

THE MOND GAS-PRODUCER PLANT.

At the Meeting of the Institution of Civil Engineers on Tuesday last, a paper on the above subject was read by Mr. H. A. Humphrey, Assoc.M.Inst.C.E.

The author began by remarking that the advantages of gaseous over solid fuel had led to an increasing demand for gas-producers to convert the latter into the gaseous state. These appliances had, he said, hitherto been constructed to make gas with little regard to bye-products, and none had been made to give good results with cheap slack coal; and where the use of gas for engines was concerned, only expensive fuel, such as anthracite or coke, had been found available. The Mond producer and recovery plant which he described not only employed cheap bituminous fuel, but recovered from it 90 lbs. of sulphate of ammonia per ton, and yielded a gas eminently suitable for use in engines and applicable to all cases of furnace work.

The difficulties to be overcome before bituminous slack could be utilized in producers were mentioned; and the author showed how Dr. Ludwig Mond, F.R.S., had not only succeeded in surmounting them, but had advanced the subject another stage by recovering as ammonia 70 per cent. of the original nitrogen contained in the fuel. The distinguishing features of the Mond process were enumerated; and the author described in detail the manner in which the plant is worked, including the mechanical handling of the fuel, the means adopted to preserve and recover the ammonia, the conversion of this into marketable sulphate, and the systems of regeneration by means of which considerable heat-economy was effected. Diagrams and drawings of the plant accompanied the paper; and tests of the temperatures in different portions of the process were given.

In the summer of 1895, Mr. Humphrey studied the Mond producer plant at Winnington, and obtained figures relating to its working necessary for a complete set of calculations. The results were shown in appendices giving all the data from a three days' trial. The measurements of the quantities and weights involved, the chemical analysis of slack and gas, the calculation of heat-quantities, and the cost of materials, wages, &c., had been accurately determined, and were given in tabular form. The results showed that, for every ton of fuel fed into the producer, about 2½ tons of steam and 3 tons of air were blown through the grate; the mixture being at a temperature of 250° C. Of this steam, 1 ton was furnished by the system of regeneration, and 1½ tons were added as exhaust steam from various engines and pumps. Upwards of half a ton of steam was decomposed in passing through the hot fuel; and nearly 4½ tons of gas were formed from 1 ton of coal—equal to about 160,000 cubic feet at ordinary atmospheric temperature. This gas had a calorific value of 81 per cent., calculated on the calorific value of the ton of fuel gasified; and the net cost, including fuel, labour, &c., was less than 5s. at the present price of sulphate of ammonia. When Mond gas was burnt with air, both in the cold state, the resulting temperature was 1150° C.; but with regeneration it was possible to reach temperatures beyond the range of any form of pyrometer at the disposal of the author. The first circular Mond producer was started in September, 1893; and for three years there were no repairs either to the brickwork lining or to the producer proper.

In dealing with the application of the Mond producer plant, Mr. Humphrey was able to give the actual figures obtained at Winnington, where Mond gas has been applied to furnace and boiler heating, the manufacture of steel, and for motive power. In each case, great economy arose from its use. In a Babcock-Wilcox boiler, the gas from 1 ton of fuel evaporated more than 7 tons of water from and at 100° C.; and the gas had proved eminently suited for use in the manufacture of steel.

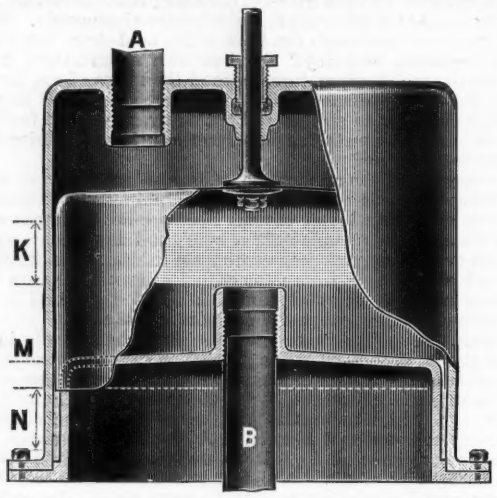
In 1894, the author carried out the first experiments in the application of Mond gas to the generation of mechanical power. The trial of a 25 nominal horse power Otto-Crossley gas-engine gave most satisfactory results; 2166 horse-power-hours being obtained per ton of fuel in the producers—the thermal efficiency of the engine being 23·8 per cent. A much larger engine was, he said, being erected to drive a dynamo with an output of 75,000 watts. For purposes of comparison, tables relating to Dowson and Lencauchez producers were given. In order to better realize what might be accomplished in the way of cheap power supply, the case of a 10,000-horse power central station was considered, to show the design of the gas-producers and recovery plant suitable for providing the necessary gas for this power. A summary of the advantages to be derived from central power stations on the lines indicated concluded the paper.

GREENALL AND HEATON'S IMPROVED GAS-METER.

Our readers may possibly remember that, in the "Register of Patents" in the "Journal" for the 22nd of September last, we described and illustrated an important improvement in gas-meters devised by Messrs. Greenall and Heaton, of Leeds. Its object is to provide an arrangement which will dispense with the use of water, which will not require leather in its construction, and not be subject to the variations and uncertainties of measurement and working which occur in the wet and dry meters now in general use. The measuring cylinders of the new meter—which has been termed the "Positive"—are constructed of metal, and do not change their form or dimensions as do the diaphragms of the existing dry gas-meter; and it is claimed that when once the stroke of the pistons has been set to give a correct measurement, it remains without variation. Each cylinder consists of an inner and outer portion, closed at the top by covers—the inner portion being the shorter; while a moveable piston, actuated by the gas to be measured, is enclosed between the two. In order to prevent the escape of gas from the inside of the piston to the outer portion of the cylinder, and *vice versâ*, the open end of the piston is sealed with mercury, a ½-inch seal being equal to a pressure of 6½ inches; and the cylinder lids and gas-supply pipes are so arranged as to prevent the escape of the mercury if the meter is inverted. The gas passes through the inlet into a valve-box—the flow of gas to and from the cylinders being regulated by two slide-valves; and the gas is admitted to, and exhausted from, the measuring cylinders in much the same way as in an ordinary dry meter. The gas enters both above and below the pistons through the supply-pipes; and the slide-valves are actuated by a double crank-shaft—the cranks being set at right angles instead of the valves. Motion is transmitted from the pistons to the valves by means of two independent levers (one double-armed and one treble-armed), actuated by the piston-rods; and rods connect one end of the latter, and one arm of the former levers to a stud on a lever fixed to the double crank-shaft which actuates the valves. The lever has a circular motion, revolving continuously in one direction; and in it is a slot, the position of the stud in which serves to regulate the length of stroke of the two pistons, so that the exact quantity of gas per stroke can be correctly fixed, as the stud is adjustable in the slot. On the other end of the double crank-shaft is a pinion, which actuates a dial recording apparatus of the usual kind, through the spur-wheel. The measurement depends entirely on the length of stroke at which the pistons are adjusted and fixed, and is not affected by any subsequent variation of the height of the mercury line.

It is claimed by the patentees that their meter is absolutely positive and unvarying in action; and among other advantages stated to be possessed by it are that there is no water to cause rust in the working parts or freezing in winter, while there is an absence of leather diaphragms, which so frequently get out of

order or require renewal. The meter also does away with the necessity for the periodical attention required with wet meters, and the cleaning and renewals needed by dry ones. The meter will pass a much larger quantity of gas than those of the ordinary type; and only about five sizes will be necessary to cover the range up to 200 lights. These advantages are confirmed by reports from several well-known gas engineers. Mr. Thomas Newbigging, M.Inst.C.E., states that if a meter could be constructed upon the principles above set forth at a reasonable



price, it would gradually make its way, and by its intrinsic merits find acceptance with gas managers. The tests he made of the meter were very satisfactory; and he expresses the opinion that not only is the name "Positive" peculiarly applicable, but that in the use of the instrument the number of sizes will be materially reduced, while generally it combines the advantages of both wet and dry meters without any of their defects. Professor Goodman, of the Yorkshire College, Leeds, has also examined the meter; and he comes to much the same conclusion as Mr. Newbigging—adding that all the readings were bound to be accurate, as the displacement of the measuring pistons was quite positive and invariable. Other well-known authorities who have tested the meter, have presented equally good reports.

The accompanying sectional block of the measuring cylinder of the meter indicates pretty clearly the principal feature of the invention. The supply and exhaust for the top chamber above the piston are shown at A, and those for the lower chamber underneath the piston at B; both pipes being connected up to their respective valve-ports. As already stated, the length of stroke of the hollow cylindrical piston, shown in the illustration, is, after correct adjustment, fixed and definite; and the light dotted space opposite K indicates the displacement of gas at each down-stroke—there being, of course, a corresponding displacement during the up-stroke. The height of the mercury line previously referred to is shown at M; and when the piston is at the top of its stroke, as indicated in the illustration, the bottom edge is half-an-inch deep in a narrow annular reservoir of mercury. The top and bottom piston stroke is shown by the double arrow at N.

THE USE OF VULCANITE AND DELTA METAL IN THE CONSTRUCTION OF WATER-METERS.

Herr F. Lux, of Ludwigshafen-on-Rhine, read a paper on this subject at the last general meeting of the Central Rhenish Association of Gas and Water Engineers. The following is a summary of its contents:—

The author said that the meters under consideration were of the rotary or wheel type, consisting of a vaned wheel or fan, set concentrically in a cylindrical chamber. The spindle of the wheel actuated a train of wheelwork connected to a counter, by which the number of revolutions of the wheel was recorded—the quantity of water corresponding under certain conditions with a given number of revolutions, having first, of course, been ascertained. The spindle of the wheel transmitted motion to the first cog-wheel of the wheelwork, either by means of an endless screw, or by means of a pinion. The friction was greater with the endless screw; but, on the other hand, the first cog-wheel was turned through a smaller angle per revolution of the fan, and thus the train of wheelwork was less than with pinion gearing.

The rotary water-meter was a high-speed machine; but, unlike high-speed steam-engines, it had to run without attention. Its wearing parts, however, were lubricated by the water under which they run; and the actual work performed was very little. Nevertheless the frictional resistance should be low initially, and should increase as little as possible in course of time. Materials that were unaffected by water must be used in the construction of water-meters; and the running parts must move with as little friction as possible.

Iron was too subject to oxidation, copper was too soft, zinc was too brittle, and nickel and its copper alloys were too liable to oxidize, for advantageous service in water-meters. Red brass and bronze were more suitable; but "Delta Metal," and the similar alloy "Durana Metal," surpassed all. Delta Metal is a brass containing about 3 per cent. of iron, and is indifferent to the attacks of water and the gases and salts dissolved therein. It is the most suitable material for the main spindle and pivots of water-meters. But since it is an axiom in mechanics that like must not run upon like, if friction is to be kept as low as possible, another material must be provided for the bearing surfaces, &c. A most suitable one has been found in vulcanite.

Taylor, in an English patent in 1852, referred to the use of caoutchouc for the wheels of water-meters; but the first mention of vulcanite for such purposes in the German papers appears to have been made in 1871. Vulcanite has a low specific gravity (1·25); and, therefore, wheels made of it are very much lighter than those made of copper alloys. Leopolder, of Vienna, was the first to use vulcanite for the cog-wheels of water-meters; but he only applied it to the first two. Then Dreyer, Rosenkranz, and Droop used it for the fan and the first cog-wheel. Though it answered perfectly in these positions, its use was not extended further by either of these makers. Schinzel, of Vienna, was the first to give it a more extensive application. He made all cog-wheels and the measuring chamber of vulcanite, and set all the spindles in it. The pivots of the main shaft were made by him of vulcanite, and ran on polished agate. For any of the parts where metal was essential, he used Delta Metal. Schinzel's meter rapidly began to oust all others from the field; and soon vulcanite and Delta Metal were cautiously adopted by other makers. Herr Joly, the Manager of the Cologne Water-Works, has testified to the good working of the Schinzel vulcanite meters. In 1895, he said that 16,000 water-meters procured since 1892 had had their metal parts attacked by the water of the Cologne supply to such an extent that the wheels frequently ceased to turn, and every one of them had to be reconstructed. This did not happen with the Schinzel vulcanite meters working at the same time. Herr Joly's testimony is an eloquent recognition of the correctness of the view that vulcanite, in conjunction with Delta Metal, is the most suitable material for the construction of water-meters.

THE USE OF BREEZE AS FUEL.

Herr J. Haymann, of the Nuremberg Gas-Works, recently communicated to the Bavarian Association of Gas and Water Engineers details of some trials of breeze as a fuel in boiler furnaces. He used the patent grate of Herr J. Kudlicz. This has a bricked-in underblast pit, the top of which is covered by cast-iron plates with conical perforations. These plates are about 1·2 inches thick, and form the grate. The perforations are 1 inch apart, and have a diameter of 0·12 inch on the upper side, and of 0·88 inch on the lower side of the plates. In the fore part of the underblast pit are two boxed-in steam-jet nozzles, which draw in air from an air-passage, and force it into the pit beneath the grate. The total cost of fitting such a grate to one boiler was about £37.

In 1895, the Nuremberg works produced about 2100 tons of breeze, or 8·4 per cent. of the weight of coal carbonized. This breeze was sorted, and gave about 43·6 per cent. of small coke, saleable at 6d. to 9d. per cwt., and 56·4 per cent. of fine breeze, for which not more than 1d. per cwt. could be obtained. Burning this fine breeze under the boilers by the aid of the Kudlicz forced-draught furnace was therefore tried. It was found that 35 cwt. of the breeze was used in 24 hours; whereas 21 cwt. of brown coal or lignite, costing about 11s. per ton, had formerly been used. The value of the breeze was therefore about 4d. per cwt. The draught was, however, so impaired by clinker that it was necessary to clean the furnace grate every three or four days. This took from 20 to 25 minutes on each occasion; and the steam pressure then dropped from 7 to 5 or 4½ atmospheres. It was therefore impossible to use this fuel when the stress of winter work demanded the utmost power obtainable from the boiler; and it was anticipated that the fluxing of the ash might be considerably diminished by the use of a coarser breeze. The 56·4 per cent. of fine breeze was therefore subjected to a further sorting; and in this manner 11·4 per cent. of the original breeze was separated as coarse breeze. This was tried on the Kudlicz grate, and only 30 cwt. was used in 24 hours; so that it had a value as boiler fuel of about 4·7d. per cwt. The boiler ran for four weeks; and cleaning of the draught-holes was not necessary. It continued at work for 151 days; and when it was then let down for official inspection, two of the perforated plates of the grate were found to have warped and to be broken. During the period of the trials, the demands on the boiler were very variable, so that exact comparisons between the duties of the breeze and other fuels were not possible.

The conclusions drawn from the trials were that the Kudlicz grate could be readily and cheaply applied to a single boiler; that it needed no more attention than the ordinary grate; and that the boiler did not suffer more than by ordinary firing. Coarse breeze did not block the draught passages, and formed an excellent fuel; fine breeze could also be used, provided the grate was frequently cleaned and the boiler was not required to work at its full power.

REGISTER OF PATENTS.

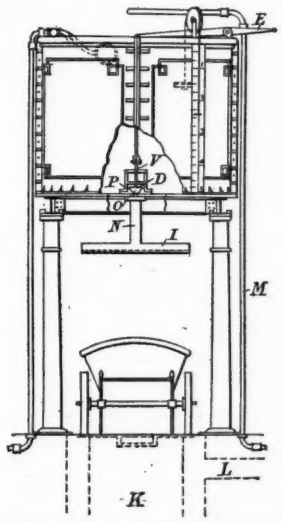
Igniting Incandescence Gas-Lamps.—Canellopoulos, J. M., and Kratz-Boussac, H. O., of Paris. No. 3316; Feb. 13, 1896.

Last week (p. 590) an abstract was given of a specification of the above patentees' previous invention for a "carbon pellet" to be used for igniting gas by the mere contact of the gas with the substance of which the pellet is composed; and the present invention relates to the arrangement of the igniting-service in such a manner as not to be exposed to the action of the lamp-flame, while the supply of gas thereto is controlled by a valve, the opening and closing movements of which are effected by contraction and expansion (caused by changes of temperature) of a suitable solid, liquid, or gaseous body. The arrangement is such that when the lamp is not burning, the valve will be in its open position, so that, on opening the main gas-cock, a jet of gas will impinge on the igniting body, and by its ignition will ignite the main supply of gas issuing from the lamp-burner. The heat will then cause the expansion body to close the valve, and cut off the supply of gas to the igniting body; and on the lamp being put out of use, the body will contract and open the valve, so as to permit the igniting device to again act when the lamp is to be relighted. Such a valve, with means for closing it, can be constructed in various forms.

According to one arrangement, the bunsen burner or a union connected to it is provided with a lateral pipe or bye-pass, having a small bore, and terminating in, and at one side of, and above, the outlet on which the igniting body is fixed. Above the outlet, and coaxial with it, is a nickel rod that extends through the lamp chimney. Its upper end is suitably attached to it; while its lower end is adapted to serve as a valve, and terminates above the outlet. When the lamp is not burning, the valve is at a short distance above the outlet; so that it will direct gas issuing through it against the igniting body. But, after the ignition of the gas, the rod will expand and close the valve—cutting off the supply of gas through the bye-pass until the lamp is put out of use, when it will contract, and again open the valve.

Quenching Coke.—Parlby, W., of Hereford. No. 6254; March 20, 1896.

The object of this invention is "to diminish the production of steam in the process of cooling the coke inside retort-houses, to quickly remove the coke when drawn from the retorts from the retort-house, and to avoid the labour and inconvenience usually caused to the coke wheelers by their having to lift and to throw the water by hand over the hot coke to quench it."



The hot coke is brought out of the retort-house in barrows, which are wheeled under an overhead tank erected on piers or columns, and there quenched by a shower of water issuing from a series of holes in a horizontal pipe. The tank-bottom is fitted with a specially constructed valve D, consisting of a valve proper O, valve-seat P, a perforated cover, and guides for the valve-rod V. The valve is actuated through a rod by a lever E and chain. The opening in the cistern, normally closed by the valve D, communicates through a pipe N, with a horizontal perforated pipe I, closed at the ends and forming the sprinkler. In order that the cooling water may be used over again, a tank K is arranged to receive it after passing through the coke, and convey it by means of an overflow-pipe L to storage tanks, whence it is raised again and delivered through a pipe M to the tank for re-use.

Generating Acetylene.—Reitmeyer, R.; a communication from A. Cerckel, of Paris. No. 6719; March 27, 1896.

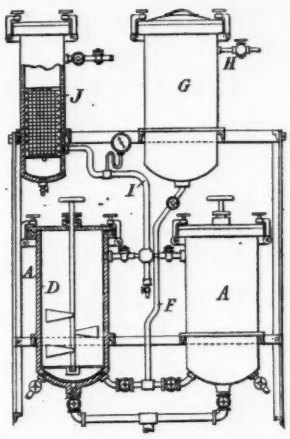
This apparatus consists in a combination of two vessels, the one containing calcium carbide or other chemical to be treated, the other containing water or other liquid. The vessels communicate with each other at their lower portion by means of a pipe provided with cocks, for allowing liquid to pass from one vessel to the other, and to be pressed back again. The first vessel is provided at its lower portion with a floating valve, opening on the passage of the liquid, and again closing when the liquid is pressed back—thus preventing the gas from escaping by the second reservoir. The vessels are combined with a gasholder or pressure-regulating reservoir communicating, by means of a pipe, with the first gas-generating vessel, and provided with another gas-outlet tube; the generator being furnished with a regulating arrangement—opening and closing automatically a valve or cock mounted upon a communicating pipe between the first generator and the gasholder, for the purpose of governing the admission of gas into the holder, and to thus obtain a perfectly even flame in the burner.

Manufacture of Calcium Carbide.—Haviland, F. H., Holloway, A., Collier, J. B., and Murch, W. H., all of Bournemouth. No. 15,489; July 16, 1896.

This invention relates to the manufacture of calcium carbide from carbon and oxide of calcium, by means of heat. The operation as at present conducted is effected by electrical means; the materials being placed between and around the poles which set up the electric arc. This system has the disadvantage that (the lime being an imperfect conductor) the greater portion of the heat and energy is expended in heating the mass to a temperature which is below that required for the chemical re-action desired. In the arrangement now proposed, the mixture of carbon and oxide of calcium is heated up to a moderate temperature by means of a furnace (surrounding the vessel employed), in which either solid or gaseous fuel is used, or by means of hot air or other gases forced into flues surrounding the vessel. As soon as the preliminary heating is effected, the current is switched on; and this almost instantaneously raises the temperature sufficiently to ensure chemical re-action between the carbon and the oxide of calcium, which results in the production of calcium carbide.

Production of Acetylene and Carbonic Acid Gas Combined.—Goodwin, R., of Dublin. No. 17,644; Aug. 10, 1896.

This apparatus for the manufacture of a mixture of acetylene gas and carbonic acid consists of a combination of (1) a vessel charged with a mixture of calcium carbide and lime, chalk, or marble; (2) a vessel from which acidulated water is supplied in regulated quantities to the first vessel, for generating both acetylene and carbonic acid; and (3) a vessel divided by perforated partitions into three compartments, the upper one of which is charged with sulphate of copper for purifying the gases, while the middle one contains wire filling for effectually mixing the gases passing through it—the lowest compartment serving to collect the separated impurities.



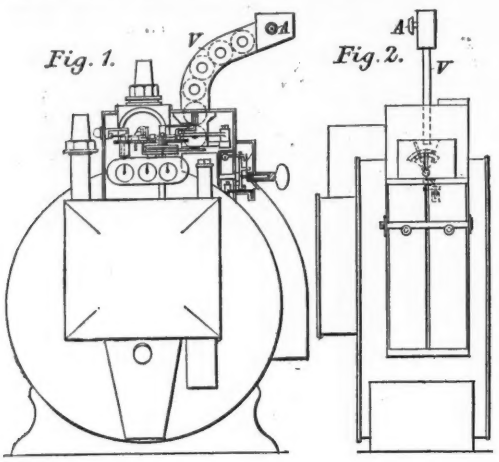
A are cylindrical vessels lined with lead and closed at top by a cover, secured gas-tight by being pressed down by pivoted screw clamps. The vessels are charged either with calcium carbide alone or, when it is desired to mix carbonic acid with the acetylene, there is added a certain proportion of lime, chalk, marble, or other substance that will produce carbonic acid when treated with acidulated water. The carbide is, for convenience of renewal, contained in a removable cage D, of perforated iron or of iron wire. Centrally through a stuffing-box in the cover, passes a spindle E, having projecting arms capable of being rotated by a crank handle, for stirring up the carbide and lime, &c., so as to produce effective action of the water on the mixture. The vessels are connected at their lower ends by a branched pipe F, with an upper vessel G (also of iron lined with lead), supplied through a pipe H with water or with water acidulated with sulphuric acid, and from which the water is allowed to flow down in regulated quantities through the pipe F, which is for this purpose provided with stopcocks and a check-valve. The gases generated in A are led from the upper parts through a branched pipe I provided with stopcocks, to the lower part of a purifying vessel J, also made of iron lined with lead. This vessel is divided, by two perforated lead partitions, into three compartments. The middle one of these is filled with wire, preferably of lead coiled in various directions round a star-shaped frame of either lead or iron; and the pipe I enters the lower end of the compartment, so that as the gases enter the compartment they will, in rising through the lead wire filling, be effectually mixed. The mixed gases then pass through the upper partition into the top compartment of J, which is filled with sulphate of copper, to purify the gases flowing through from impurities, such as arsenic; and the purified gases are led off from the upper end of the compartment, through a branch-pipe K, to a gasholder. The impurities separated from the gas descend by gravity into the bottom compartment, whence they are discharged from time to time through a pipe provided with a cock. The top of the vessel J is closed by a removable gas-tight cover.

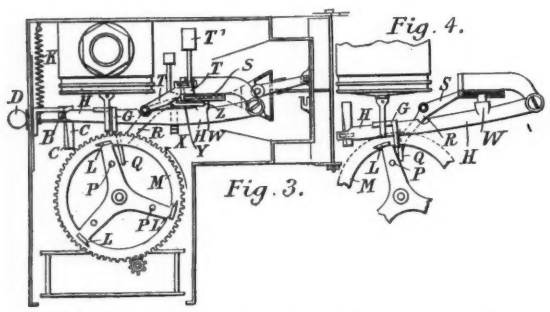
Coin-Freed Gas-Meters.—Giroud, L., of Paris, and Sappey, M., of Auteil. No. 20,433; Sept. 15, 1896.

This invention connected with coin-freed gas-meters has for its object: First, certain means by which coins of predetermined values can, after insertion into a receiver (and the lower one by its weight releases a catch) permit of an appliance being moved by hand so as to open the gas-valve, which will continue open until all the coins successively pass from the receiver. Secondly, certain appliances whereby an inspector at any time can check the quantity of gas consumed, and simultaneously shift the travel of the succeeding falling coins, in order to keep them separate from those which fell before the inspector's visit. Thus, if the returns of consumption from the inspector's book be transferred to the coin collector's book, the number of coins corresponding thereto should be found

in the till of the meter previously checked by the inspector. The second part of the invention is applicable, with slight changes, to most coin-freed meters.

The coins, placed in a shoot on edge, fall upon a plug in succession; the plug being part of a lever moveable to start the meter by a hand pull, which becomes released after setting the plug-lever. The plug-lever is connected to a diaphragm, having the valve affixed to its centre pin. The plug has effect against the lower coin only; and by a slotted plate on it, it can be moved, by wedges on a wheel of the index mechanism (operable by the meter only), a distance sufficient to release the lower coin to fall into one compartment of a double till. The distance between the respective wedges of the meter operable wheel, determines the quantity of gas to be consumed for each coin. The wheel has also a series of studs, which remove a shutter and a platform simultaneously in opposite directions, for supporting and freeing the coins in succession. In the event of no coin being in position for the plug to press against, the plug-lever is locked by a weighted catch, capable of release only by the pressure of an inserted coin against a nosepiece. The till is double, or two tills are set in such a position in relation to the meter that a plate moved over by an inspector's key will direct the coin into one or other of them, which for the time becomes locked and the other unlocked, but which unlocked till can alone be got at by a collector who has a different key and a separate lock to open before he can remove the money.





As shown in the engravings, the action of the meter is as follows (fig 3 illustrating the mechanical parts in their respective normal positions): On a single or several coins being passed on edge through a slot in the top of the box or receiver, a pressure on the button head A allows them to roll down the shoot V, and move the nosepiece Z to release the catch X from the lever H, to allow the gas-valve to be opened—the coins lodging on one another, and with the lower one resting on the plug W. The lever is now moved by pressure exerted on the knob D of the hand pull, by reason of its inner end (which carries a slip-paul) bearing against the upper end of the vertical slider bolt B, which is gradually slid downwards by its lower end riding in the slot C until its top end escapes from the contact of the slip-pawl. The plug W, by the movement of the lever H, comes into the position shown at fig. 4—*i.e.*, away from under the lowest coin, which consequently falls on to the platform S; the face of the plug, by the release of the lever H, then pressing by the spring K against the side of the coin which was released from above. The pull-forward movement of the lever H removes the valve from its seat, and the port is opened for the flow of gas from the main to the meter; the plate G having been brought over the face of the wheel M for its notch to be in line with the point of the wedge L. The meter mechanism is in connection with the wheel M; and as this wheel rotates in the direction of the arrow (fig. 3), the wedges L force their way into the notch in succession by the working pressure of the gas, and pull the lever H a little farther—*i.e.*, sufficient to let go its hold against the coin which still remains on the platform S.

During the movement of each wedge through the slot of the plate G, the pin P presses against the blade Q of the lever R, and turns it sufficiently far on its pivot pin as to withdraw the platform from under the first coin, which now drops into the till; the plate T entering the slot to retain the remaining coins in the shoot. As the pin P escapes from the blade Q, the platform S and the plate T return to their normal positions under the care of the balance-weight T1 for a repeat action from the wheel M; the wedge L having by this time nearly got clear of the notch in the lever H, which then, by the spring K, is drawn back for its plug W to press against the succeeding coin and to keep the gas-valve open. The foregoing operations in sequence are effected for each coin left in the shoot.

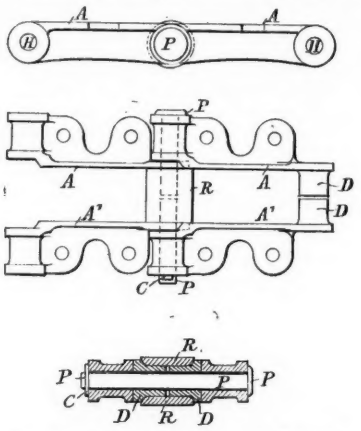
So soon as the last coin drops from the shoot, the plug W, having nothing to press against, is drawn by its spring K farther into the hole in the shoot in which it has a lodgment; the gas-valve being by this extended motion closed again, and the flow into the meter shut off. The pawl X, by reason of there being now no coin in the slot for it to engage against, assumes its normal position; and the lever H, in returning, rides over the nose of, and engages with, the catch X, to thereby become locked and prevented from being moved by the knob D until a fresh coin be inserted and falls down the shoot.

Gas-Burners.—Claude, H., of Brussels. No. 26,305; Nov. 20, 1896.

This invention relates to a bunsen gas-burner for producing a flame adapted to be employed with incandescent mantles made of fabrics consisting of metallic threads. The burner comprises a tube, whose lower part is perforated or reticulated so as to give free passage for air, and fitted on a gas-distributor formed of a metal disc, with a nipple threaded for attachment to the gas-supply pipe. The disc is provided around its centre with a number of small perforations, for the passage of the gas; and to the centre of its upper face, there is a small inverted cone for directing the jets of gas towards the inner surface of the imperforate or non-reticulated part of the tube or chimney. The perforations of the disc are made in such a manner that the jets of gas traverse the perforated part of the tube, and strike the internal surface of the latter above the perforated or reticulated part, either directly or after having struck the surface of the directing cone.

Links for Conveyors or Elevators.—Hunt, Charles, of Birmingham. No. 29,817; Dec. 28, 1896.

These links (made of any configuration to suit the conveyors or elevator buckets) consist of two separate side-pieces A A1, which form each link in conjunction with a hollow roller R and pin P. The links are made right and left handed, so that the spigots or projections D, upon which the roller fits loosely, face each other. The plan shows the roller at the junction of the two links; but the roller at the right hand is omitted, so as to make plain the projections or spigots, which constitute



a very important feature of the invention. These projections D are cast or forged upon the sides of the links A A1, and the wear caused by the roller turning is upon them, and not upon the pin, as this merely serves as a connecting medium for the links, and does not carry the strain due to the conveying or elevating work of the chain. The links have a collar at the spigot end, and similar collars at the wider ends to strengthen the bosses, through the hole H of which the pin P passes to fasten the links together. The pin may be secured by lock-nuts or a cotter C, as desired.

APPLICATIONS FOR LETTERS PATENT.

6035.—Dunsmore, M. C., "Gas and oil engines." March 8.

6036.—Birch, W., "Gas cooking-stoves." March 8.

6078.—Boult, A. J., "Production of acetylene gas." A communication from F. Janssens. March 8.

6123.—Yates, H. J. (Arden Hill and Co.), "Burners for gas-cooking apparatus." March 9.

6132.—Climie, W., and Watson, A., "Gas-producers." March 9.

6221.—Gibbon, J. G., "Multitubular sanitary lamp for street lighting and destroying sewer and other noxious gas." March 9.

6249.—Kenyon, J. H., "Incandescent gas-light burners. March 10.

6271.—Guasco, A., "Producing acetylene gas." March 10.

6344.—Glover, R. T. & J. G., "Indicating or recording the number of rotations or partial rotations imparted to coin-actuated mechanism." March 10.

6379.—Thomas, B. W., and Burley, A., "Water-valves." March 11.

6404.—Muschamp, P., and Burridge, S., "Manufacture of coke." March 11.

6449.—Kerr, W., "Operating or controlling valves from a distance." March 11.

6464.—Lake, H. H., "Incandescent gas-burners." A communication from A. Desmazures. March 11.

6477.—Epstein, G. J., "Apparatus for heating and motive power purposes, and for the production of water gas and other gases." March 11.

6538.—Biss, W. R., "Generating and storing acetylene gas." March 12.

6548.—Fauré, R. F., "Producing acetylene gas." March 12.

6645.—Tournet, E. L., "Oil and gas engines." March 13.

6648.—Keene, T., "Manufacture of calcium carbide." March 13.

6658.—Strode, W. W., and White, G. H., "Manufacture of acetylene." March 13.

6659.—Strode, W. W., and White, G. H., "Illuminating apparatus." March 13.

6661.—Drake, J. A. & W., "Gas-engine valves." March 13.

6673.—Hamilton, J., "Mantle for incandescent gas-lamps." March 13.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Carburetted Water Gas.

SIR,—I am quite satisfied to leave my letter and Mr. Porter's rejoinder to the consideration of those taking an interest in the subject; and I should not trouble you further but for the question as to "wear and tear" contained in the latter. In answer to it, I have to say that our actual outlay under this head for the third year of working was 0·18d. per 1000 cubic feet; and this included all costs into the gasholder.

Belfast Corporation Gas-Works, March 20, 1897. J. STELFOX.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons and read the first time: South Metropolitan Gas Bill.

Bills read a second time: Crays Gas Bill, New Hunstanton Water and Gas Bill.

Bills rejected: Lowestoft Corporation Bill, Malvern Urban District Gas Bill, Southampton Corporation Water Bill.

Bills reported, with amendments: Harrogate Water Bill, Newport Corporation Bill, St. Anne's-on-the-Sea Gas Bill, Taunton Gas Bill.

Opposition withdrawn: Carnarvon Corporation Bill, Gravesend and Milton Water Bill, Harrogate Water Bill, Newhaven and Seaford Water Bill, Tynemouth Gas Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills reported: Chichester Corporation Water Bill, Crowborough District Water Bill, Dublin Corporation Bill, Edinburgh Corporation Bill, Leeds Corporation Bill, Weymouth Gas Bill.

Bills read the third time and passed: Dumfries and Maxwellton Water Bill, South Metropolitan Gas Bill.

Proposed Additional Powers for the Southwark and Vauxhall Water Company.

A Bill has just been deposited, by special leave of the Standing Orders Committee, in the Private Bill Office of the House of Commons, by the Southwark and Vauxhall Water Company, to enable the Company to increase the quantity of water they may take from the River Thames. The preamble recites that, by an agreement between the Company and the Thames Conservators, made in 1886, it was arranged that the former might take in any 24 hours, from midnight to midnight, any quantity of water from the Thames not exceeding in the whole 24½ million gallons. It then goes on to state that the demands upon the Company have increased, and that during recent years they have from time to time taken more than the above-named quantity of water daily for the purpose of fulfilling their statutory obligations with respect to the supply of water within their limits. It is pointed out that the Conservators lately commenced an action in the Queen's Bench Division of the High Court of Justice against the Company, founded on the agreement, claiming an injunction restraining the Company from taking from the river more than 24½ million gallons per day (see *ante*, p. 187). The Company say that, by reason of the growth of population and increased demand for water, they require to take from the Thames more than the specified quantity; and that the Conservators have consented to the injunction referred to being suspended pending an application to Parliament by the Company for power to obtain the water required by them in order to meet the necessities of the population within their limits, and otherwise for the fulfilment of their statutory obligations. The Bill consists of five clauses, and the enacting portion sets forth that the Company may take from the Thames as much water as may be required by them for the purpose of fulfilling obligations imposed upon them by statute with respect to the supply of water within their limits, provided that they shall not in any half year ending June 23 or Dec. 24, take from the Thames (including water from Platt's Eyot) more than 45 million gallons of water per day. A further proviso sets forth that the Company shall not take more than 24½ million gallons per day when the flow over the weir about to be constructed by the Conservators across the river at Penton Hook is in such day less than 300 million gallons, or, pending the construction of such weir, when the flow over Bell Weir is in such day less than 265 million gallons. The sums to be paid to the Conservators half yearly are: For an excess of 5½ million gallons, £525; of 10½ millions, £1002 15s.; and when the quantity shall have exceeded 13½ millions, the sum of £1002 15s., and a sum calculated at the annual rate of £191 per million gallons by which such quantity shall in the last past half year have exceeded 10½ millions, and by further gradations the payment is to rise to £1957 for 18½ millions. It is provided that the Conservators shall carry to the Upper Navigation Fund, constituted by the Thames Conservancy Act, 1894, all sums paid to them under the Act. Clause 4 declares that the Act shall remain in force eight years, and that the Company shall in the year 1898 introduce a Bill for the purpose of obtaining statutory powers for the construction of storage reservoirs and the taking of as much water as might be required after the expiration of that period.

The petition for the foregoing Bill was presented last week, and was referred to the Examiners, one of whom will have it under consideration on Friday next.

HOUSE OF LORDS COMMITTEE.

Thursday, March 11.

(*Before Lord* POLTIMORE, *Chairman; the Marquis of* BATH, *Lord* COLCHESTER, *Lord* AMPTHILL, *and Lord* ABERDARE.)

GRAVESEND AND MILTON WATER BILL.

The Committee—after disposing of the St. Anne's-on-the-Sea Gas Bill, as reported last week—proceeded to consider the above-named Bill.

Mr. FREEMAN, Q.C., Mr. CLAUDE BAGGALLAY, and Mr. G. B. ROSHER appeared for the promoters, the Gravesend and Milton Water Company; Mr. WORSLEY TAYLOR and Mr. MORTON SMITH, for the Urban District Council of Northfleet; and Mr. SYDNEY HOLLAND for the Tradesmen's Association of Gravesend and Northfleet, who opposed the Bill.

Mr. FREEMAN, in opening the case for the promoters, said the Bill was to enable the Gravesend and Milton Water Company to raise additional capital, and for other purposes. The questions involved were very simple, and would not occupy much time, as a great part of the case had been withdrawn. The Company, he pointed out, was established as far back as 1833; and they obtained parliamentary powers in 1846. The capital was now £40,000, with borrowing powers to the extent of £10,000; the profits being restricted to 10 per cent. There was the usual power, when the profits exceeded 10 per cent., to make up arrears of dividend. When arrears had been made up, the Company were to create a reserve fund which was not to exceed £4000; and after that, the interest was to be applied to the general purposes of the Company. When this condition of things had been reached, an abstract of accounts was to be laid before the local Justices, who had power to appoint an examiner; and if he reported that the £4000 reserve fund had been invested, then it was competent for the Justices to alter the price of water. The district supplied was Gravesend, Milton, and Northfleet—Northfleet, for rateable purposes, being as nearly as possible half the size of the other district. The actual dividend the Company had been in the habit of paying from 1847 to 1878 had risen from 2½ to 8 per cent. In 1856 and 1857, they paid no dividend at all; and then from 1878 to 1889, they paid the full 10 per cent. Since then, they had paid off accumulated back dividends to the extent of £6000; leaving a large sum that they were still entitled to pay off. The time had not come when they could call on their reserve fund. There had been from time to time certain questions raised by the Corporation of Gravesend and the Local Authority of Northfleet; the two points they had in mind being these: Under their Act, there was no obligation on the Company to give a constant supply; and up to the present, they had not given such a supply. From time to time, various interviews had taken place; and the Local Authorities expressed the opinion: First, that the Company should give a constant supply of water, or a better supply than then existed; secondly, that the Company should sell their undertaking to them. In regard to the first point, the Directors had always been most anxious to meet the requirements of the authorities; and from time to time they had improved the supply. In particular, when complaint was made of the supply being on for only 2 hours in the course of the day, the Company changed it to two supplies of 1½ hours each. As to the second point, the Company said: "We do not wish to sell; there is no reason why we should." At no time had the Company varied this attitude. Since the double supply had been given, there had been few complaints either from Gravesend or Northfleet. The Company had only once failed to give an adequate supply, the cause of which was the breaking down of their double set of machinery. It was now recognized that, if circumstances would allow of its being done, it was almost the duty of the Company to give a constant supply. When urged to do so, the Company had replied, in the first place: "A constant supply of water has to be taken in connection with means of getting rid of the water in the place to be so supplied. You (Gravesend) are at present drained entirely by a cesspool system; and if we were to give you a constant supply, the result would be an abnormal leakage from our reservoirs, which would not be of use to the consumers, but would flow into the cesspools and saturate the ground, and be a source of danger and evil to the places sought to be benefited." They said: "If you will construct sewers, and take means to properly drain the district, we will adopt measures to give a constant supply."

The CHAIRMAN: Is it the fact that the whole of Gravesend is drained by cesspools?

Mr. FREEMAN said that, according to his information, there was no drainage there. The Company had tried to give a constant supply; and every night they had found that their reservoirs had sunk about 8 feet beyond what they ought to have done—a thing which no prudent water company could allow to go on. The learned Counsel submitted that the view of the Company with regard to a constant supply was shared by the consumers. In 1895, certain specific complaints as to the water supply in houses were made. These complaints were investigated; and it was found that they were due to there being insufficient cisterns, or to the fittings being entirely out of order. The Company admitted that the supply was not so large per head of the population as they would like to see it; but baths were not as a rule fitted in the houses, and it was not a water-closet town. Under the present Bill, it was proposed to extend the water supply to 25 gallons per head, which would be ample. There had never been a complaint that the water was not sufficient to extinguish fires; and as to quality, it had been analyzed by Dr. Dupré, and declared to be excellent for domestic and dietetic purposes.

The CHAIRMAN: Where does the water come from?

Mr. FREEMAN: From wells. The learned Counsel went on to explain that, in addition to this Bill of the Water Company, the Corporation of Gravesend had prepared a Bill for the purpose of purchasing the undertaking; and they and the Northfleet Local Authority had promoted a third measure jointly for the purpose of establishing a Water Board. The Corporation of Gravesend could not proceed without the consent of the ratepayers. They had taken a poll; and by a substantial majority, the ratepayers said: "We do not approve of your buying up the Water Company; nor do we approve of your opposing the Company's Bill." The Corporation Bill and the Joint Bill of the Gravesend and the Northfleet authorities, therefore, had to be withdrawn. Gravesend did not oppose; but as the poll in Northfleet showed a majority of two in favour of the Local Authority, that district was represented as

petitioning against the Bill. The Bill before the Committee sought to raise £20,000, and proposed that a sum of upwards of £8000, borrowed from the undivided profits of the shareholders for temporary purposes, should be converted into ordinary capital—an arrangement which, he argued, would hurt no one. The learned Counsel then went through the petitions of the opponents of the Bill. He traversed the statements contained therein; joining issue with the petitioners in their allegations, and declaring, with regard to the tradesmen's petition, that so far as Gavesend was concerned, it ought not to have been presented, as the tradesmen, being ratepayers, were bound by the action of their Local Authority. He contended that the tradesmen of Gravesend, and those of Northfleet also as being joined with Gravesend, had no *locus standi*.

Mr. SYDNEY HOLLAND having replied in support of the *locus standi* of the Tradesmen's Association,

The COMMITTEE decided against the petitioners in question.

Mr. FREEMAN drew attention to a report of the Local Government Board upon the Bill, and pointed out the questions raised there in the nature of complaints. He said that either the Bill was introduced to meet them, or clauses would be brought up for this purpose in the event of the measure being allowed to proceed.

Evidence was then called for the promoters.

Mr. *M. A. Troughton*, Chairman and Managing-Director for the past ten years of the Gravesend and Milton Water Company, corroborated the opening statement of Counsel. He declared that during the time he had been Manager of the Company, their water supply had not failed—not even during the drought of 1895-96. There had been a partial failure once owing to the machinery breaking down; but this was a most unusual accident. Having described the works which it was proposed to carry out under the Bill, he declared that any complaints which had been made against the operations of the Company had always been inquired into, and, where possible, met.

Witness was cross-examined by Mr. MORTON SMITH, with a view to showing that the supply of water should be a constant one. He declared that, under the advice of Lord Herschell, the Company had refused to give a constant supply, for the reasons which had been already detailed. He was then questioned in relation to the loan of £8000 to the shareholders.

Mr. FREEMAN took exception to these questions, on the ground that they did not arise on the petition.

Mr. MORTON SMITH said his object was to show that the Company had kept out of Parliament; that the result of their doing so had been that the Company had not become modernized; and that this borrowed money had gone on accumulating to the prejudice of the consumers.

The CHAIRMAN decided that the cross-examination was legitimate.

Witness went on to say that, so far as he was concerned, he had been for years endeavouring to come to Parliament; but his fellow Directors would not agree. Since 1889, the Company had paid more than 10 per cent.; and they had done so since the period when they started paying capital expenses out of revenue. The Bill was asking for £20,000 of new capital, though it was true that no detailed scheme for the expenditure of this sum had been prepared.

After some further evidence,

Mr. MORTON SMITH said that, with regard to a constant supply, if the promoters would insert in the Bill a clause fixing a date for such supply, his clients would be satisfied.

Mr. FREEMAN said the Company would do so; but they must be held blameless for difficulties arising through overflowing of cesspools.

The CHAIRMAN said the matters between the parties seemed of small moment; and it would be well if an agreement could be arrived at.

Mr. MORTON SMITH said he could not undertake to say that there would be no further opposition to the Bill, even if the promoters consented to give a constant supply.

Mr. *Killick*, a cement maker, of Northfleet, said he should not like to see a constant supply of water in Northfleet, in consequence of the imperfect condition of the drainage system.

Cross-examined: In 1886 he was in favour of a constant supply; but since then the water had been turned on twice a day, and his objection no longer remained good.

Mr. *Alfred Lass*, who had examined the books of the Company, gave evidence in support of Mr. Freeman's opening statement.

Mr. *James Mansergh*, M.Inst.C.E., said he had inspected the works of the Company, and had arrived at the opinion that they ought to be enlarged. He considered the works which were at present necessary would require an expenditure of £20,000.

As the outcome of a suggestion thrown out by the Chairman, a conference then took place between the Counsel for the parties; and it was announced that an agreement had been arrived at, which would be embodied in a clause to be brought up later on.

Friday, March 12.

LOWESTOFT WATER AND GAS BILL.

The above Bill was taken by the Committee to-day.

Mr. WORSLEY TAYLOR, Q.C., and Mr. DUKE appeared for the promoters; and Mr. BALFOUR BROWNE Q.C., Mr. FITZGERALD, Q.C., and Mr. CLAUDE BAGGALLAY, for the Lowestoft Water, Gas, and Market Company, who petitioned against the Bill.

Mr. WORSLEY TAYLOR, in opening the case for the Corporation of Lowestoft, who are the promoters of the Bill, said the measure would not raise the controversial points which transfer Bills of this kind usually did. Though the Company had a double object, and supplied both gas and water, they had but one capital and one set of accounts. He would, however, deal with water and gas separately.

The CHAIRMAN: Is there more than one petition against the Bill?

Mr. WORSLEY TAYLOR said there was only one. Lowestoft, which was incorporated in 1885, was a town of considerable antiquity. But he thought it would not be necessary to go back farther than 1885. The present area of the borough was 2506 acres, the valuation about £100,000. There was a population of 26,000, which had been steadily increasing year by year—recently very rapidly. The town was a favourite watering-place. It possessed a harbour of considerable magnitude, which he believed at present contained something like 7000 fishing-boats; and there was a proposal now before Parliament, at the instance of the Railway Company, who were the owners of the harbour, to largely increase its capacity. Lowestoft was in the centre of a district, was the market town, and had been exceedingly fortunate in that it had found local gentlemen interested in the place who had given it the benefit of their own individual enterprise. The modern development of the place was largely due to two gentlemen and their families—the late Sir Morton Peto and the late Mr. Lucas. So far as towns of this character were concerned, the question of water supply was absolutely vital. It was necessary, not only that the water should be good, but that it should be good to the knowledge of the people in the town and of those who contemplated visiting it. It must be absolutely beyond the possibility of suspicion. It had been again and again found that, if there was any suspicion as to the quantity or the quality of the water, visitors said: "Oh! I cannot inquire as to the truth of this suspicion. I will make myself absolutely safe, and go somewhere else with my family." The smallest amount of suspicion caused a scare; and, as was well known, several watering-places had in recent years suffered materially from suspicion which might have been unfounded. In the case of the Brighton Corporation, they had come to Parliament for more water than they required in order that visitors might be absolutely satisfied as to the question of water supply. The policy of Parliament with regard to gas had been rather to favour the acquisition of undertakings by local authorities than the reverse; but in the matter of water, life and health depending on a proper and adequate supply, the policy of Parliament had been far and away more pronounced in favour of undertakings being in the hands of the local governing body. There was a very plain reason for this. It was to the interest of a company to discourage a free use of water; their object being to make profit—that was to say, to obtain as good a price as they could for a moderate supply of water. The tendency was to have regard more to the interests of the shareholders than to those of the ratepayers. The object and tendency of a Corporation was the very reverse. They were concerned for the health and general well-being of the ratepayers. Moreover, it was desirable that water administration should be in the hands of one authority, rather than two as at present—one supplying and the other controlling. The Corporation had their own Engineer, Sanitary Inspector, Medical Officer, and Analyst; and having these officials to control the water supply, it was clear that it would be to the advantage of the locality if the Corporation had in their hands the supply itself. He gave illustrations of the friction and difficulty which occurred owing to the existing double authority in Lowestoft in regard to water; and he pointed out that the Corporation would be able to supply water more cheaply than the Company, and to give more assistance to the poorer class of owners of house property, who were being induced, as far as possible, to replace the existing privies with water-closets. There had been difficulties with the present Company in the matter of the supply of water-fittings; and these would be removed by the transfer of the undertaking. As showing the feeling of the locality in regard to the matter, he stated that the voting on the question in the Corporation had been 28 for and 1 against; while a poll of the ratepayers had shown 2001 for and 895 against the transfer. He held that the present case was very similar to that of Chesterfield, in which the Corporation had obtained parliamentary powers for the supply of water. The Bill proposed that, failing agreement, the price of the undertaking should be decided by a fair and unfettered arbitration, under the Lands Clauses Acts, if the Company so desired. Local sentiment could not apply to the majority of the shareholders, who were not local gentlemen, but persons living in other districts. Therefore, if a fair price was paid for the undertaking, the shareholders, or a very large proportion of them, would have nothing to complain of. The capital of the Company was £150,000, which was all issued; and £140,000 was paid up. There were borrowing powers to the extent of £36,500; and £31,000 had been borrowed. The total paid-up capital, including premiums, was £176,000. Turning to the gas undertaking, he said that the Corporation probably would not have sought to acquire it if it had not been almost inextricably mixed up with the water. It might be possible to split the two businesses; and he should not object to this. But he doubted whether it could be done. The price of gas in Lowestoft at present was 3s. 9d. per 1000 cubic feet; but whether or not it might have been less if the water accounts had not been mixed up with the gas accounts, there was no means of knowing. At any rate, the Corporation were of opinion that they could supply gas at a cheaper rate than the Company. The learned Counsel, in conclusion, dealt with the petition of the Company, which set forth, among other things, that they had expended £200,000 on their works, and were promoting a Bill this session for extensions.

The following witnesses were then called for the promoters:—

Colonel *A. G. Lucas*, examined by Mr. DUKE, said he was a member of the Town Council of Lowestoft, and last year acted as Mayor. Some time ago there was an outbreak of zymotic disease in the town; and the Local Government Board sent down an Inspector (Dr. Copeland), who in his report had stated that the water supply of the town "should be above suspicion." In consequence of this report, the Council put themselves in communication with the Company, with a view to purchase; and votes of the Council and of the ratepayers had been taken, with the result which Counsel had stated. Witness pointed to the fact that Lowestoft was a flourishing and increasing seaside resort, and declared it to be desirable that the undertakings of the Company should be transferred to the Corporation in the interest of visitors, as well as of the ratepayers. The Town Council were willing that a fair price should be paid.

In cross-examination, witness said the Town Council had refused to follow the recommendation of the Medical Officer with regard to the closing of the surface wells. From one of the wells, subsequently, according to the Medical Officer's report, typhoid fever and zymotic sore throat had been contracted. He thought the Corporation should have power to supply water from other sources, so as to close these wells.

Mr. FITZGERALD pointed out that the Town Council had power to close the wells, but had never exercised it.

Witness went on to say that it was desirable to give the Corporation the powers they now sought, in the interest of the poor; but they were waiting until the fate of this Bill was decided before carrying out some of the recommendations of the Local Government Board Inspector.

Dr. *J. Thomas*, Medical Officer of Health at Lowestoft, stated that there were 3668 houses in the town without water-closets. He had taken samples of the water supplied by the Company, under favourable circumstances so far as the Company were concerned. He had sent these

samples to London for analysis; and they had been described by the Analysts as unfit for consumption without filtration. The samples were of the water as supplied to consumers. In Lowestoft, there were only 230 fixed baths; and these were subject to a special charge.

In cross-examination, witness said that, when he took office in 1895, he found that the water question was in an acute stage, because of the closing of the Livermore Wells. It was true he had recommended that five wells should be closed, and that the Council had not done it. Typhoid fever had arisen in the case of one of the wells.

Mr. FITZGERALD asked if witness had not reported that the condition of Lowestoft was dangerous in the extreme, owing to the water supply.

Witness replied in the affirmative. If people who visited the town had known as much about it as he did, they would not have taken their families there. It was true that last year he had described Lowestoft as an ideal place for consumptive people. What the Corporation wanted was to put the water right. If they had the water supply in their own hands, the source would soon be changed.

Mr. *G. H. Hanby*, Surveyor of Lowestoft, gave evidence as to the necessity for an additional supply of water for public purposes there, and as to the charge for gas in the town being excessive.

Dr. *Percy Frankland* testified to the impure character of the water supplied to the town. At the present moment, the water was in a disgraceful condition; and it could only be supplied with safety if subjected to careful filtration.

Mr. *James Mansergh*, M.Inst.C.E., said that he had examined the works of the Water Company; and, in his opinion, it was necessary, for the good of the consumers, that the undertaking should be acquired by the Local Authority—more especially as the present charges for water were so high.

Monday, March 15.

The hearing of the case for the promoters was resumed to-day.

The CHAIRMAN: I think the evidence on Friday was rather unnecessarily spun out. If the Town Clerk of Lowestoft is called, that will be quite sufficient for the purposes of the promoters.

Mr. *R. B. Nicholson*, Town Clerk of Lowestoft, who has held this office ever since the incorporation of the borough, stated that the Corporation had expended a large amount of money on sanitary improvements. In North Lowestoft, they had spent £8000 on a system of drainage; and in South Lowestoft, £13,000. With regard to suspected wells, the Corporation, on the reports of their Sanitary Officer, had always recommended the closing of wells until the case of the Livermore wells arose, when the analysis caused the Corporation to act with some hesitation. In 1896, he had written to the Company asking for permission to make a bacteriological examination; but the required leave was withheld, though subsequently Professor Frankland was allowed to make an examination.

Cross-examined by Mr. BALFOUR BROWNE: The Company charged 4s. 4d. for their water, *plus* 4s. 4d. where the house had a water-closet, which made 8s. 8d. The Corporation proposed to charge 8s. 8d., which was the same sum; so that so far as the consumer was concerned, there would be no difference.

Mr. BALFOUR BROWNE: Have you been exceedingly negligent with regard to sanitary matters?

Witness: I submit that we have not.

You have tried to make an outfall-sewer have you not?—We had one in existence between 20 and 30 years; but it was washed away by the German Ocean. We have not tried to rectify the outfall-sewer by means which were not approved by the Local Government Board. But the Board have, within the last two or three months, declined to give their sanction to the site for the outfall which the Corporation proposed.

Have you got a deposit of town filth close to the parish church?—Not that I am aware of.

If we prove that there is such a deposit near the church, and only 110 feet from one of our reservoirs, that will be news to you?—That may be. But I must point out that the parish church is a mile out of the town.

Are you aware that it is close to our reservoir?—Yes.

But you do not know of this deposit of town filth, which is night soil taken from the middens?—No; I cannot say that I do.

Is it the fact that the Corporation refused to insist on the proper waste-preventing cisterns being used in the town?—That is not so. Some years ago the question was discussed in the Council, as to whether water-flushing apparatus should be required for water-closets. The Corporation considered the matter from the point of view of the owners of cottage property; and they resolved that where the Company's water was already laid on, the Council would insist on flushing being provided; but where it was not laid on, they would not insist upon small owners going to a great expense to get the necessary fittings, with the additional outlay for the water-rate.

Have the Corporation any new source of supply to propose?—I believe the Medical Officer has one in his mind; but the Corporation have not yet had an opportunity of considering it.

Re-examined by Mr. DUKE: There were about 3000 middens in Lowestoft; but the Corporation now insist upon all new houses being supplied with water-closets and flushing apparatus.

Mr. DUKE said that was the case for the promoters. He had evidence as to the value, and so forth, of the gas undertaking, which he would call if the Committee desired it.

The CHAIRMAN: I think you have given ample evidence. By the way, the water and gas are bound up together; so that if you obtain your Bill for one, you obtain it for the other?

Mr. DUKE: We do not ask for the Bill for the gas, if we do not obtain it for the water. You cannot extract the gas undertaking accounts from those relating to the water portion. The matter turns on the water.

Mr. BALFOUR BROWNE then addressed the Committee for the Gas and Water Company. He contended that the promoters had made out no case for the compulsory transfer of the water undertaking; and that he could argue against the Bill from the evidence of the promoters, without calling any evidence of his own. If he could not maintain his position out of the evidence of the promoters, he would be compelled to call a number of witnesses, whose examination would occupy considerable time.

The CHAIRMAN: It makes no difference to us whether we sit here half a day or ten days, so long as we hear the salient facts of the case.

Mr. BALFOUR BROWNE said that if he could make out from the promoters' own case that there was nothing to base their Bill on, it would be wasting their Lordships' time to call evidence. He would not say what evidence he could call; but would confine himself to commenting on that of the other side. His learned friend had failed to prove that in this case, apart from general principle, Parliament should transfer the water undertaking from what were admitted to be the efficient hands of the Company, into the inefficient hands of the Corporation. He referred to three cases of compulsory purchase with which he was acquainted—pointing out that in two of them there was a good source of supply offered in place of a bad one (and in the present case the promoters made no alternative offer); while in the third, there were special grounds for the transfer. There was no precedent to justify the transfer on grounds of public policy; and if public policy did not warrant it, what circumstances would do so? What would justify the transfer, either of a gas or water undertaking, would be some misconduct on the part of the Company, or the offer by the Corporation of a better source of supply. But in this case, there was no default on the part of the Company; and, as he had said, there was no alternative supply proposed. There were weighty reasons against the transfer. They never found a corporation coming to Parliament to compulsorily acquire possession of undertakings like those now involved, unless they were paying concerns. Corporations always left the risk of beginning the supply to a company, and only came in when they saw their way to grab returns. There was a serious objection to its once being understood that, directly a company made a profit, their undertaking should be taken over by a corporation. The adoption of this doctrine would ruin private enterprise. As demonstrating the unfitness of the Lowestoft Corporation, he quoted from the evidence given for the promoters to show that they suffered houses to exist in the town without closets, deposits of town filth to accumulate near the parish church, and water-closets to remain without a flush of water. While, according to the report of the Local Government Board, there were 3000 middens in the town, sewage from which percolated into the ground in close proximity to the wells from which the community got their water. And all the time, the Lowestoft Corporation were advertising the town as the healthiest place in the kingdom. If it was the healthiest place in the kingdom, it was so in spite of the Corporation; the sanitary condition of the town being simply disgraceful. As to gas, the proposal of the promoters was a strong order. They had not called a single witness to deal with the matter. Why, therefore, were the petitioners to part with their undertaking. Simply because the promoters wanted the water.

The CHAIRMAN: I do not think that you need occupy yourself with the water case.

Mr. BALFOUR BROWNE said he had seen Mr. Corbet Woodall, who gave evidence in the St. Anne's case, in the room; but he had not been put into the box. If he had, he would probably have been as enthusiastic on behalf of the Company as was Mr. Mansergh.

The Committee cleared the room, and remained in private deliberation for about five minutes. On the re-admission of the public,

The CHAIRMAN said: The Committee are unanimously of opinion that the preamble of the Bill is not proved.

HOUSE OF COMMONS COMMITTEE.

Wednesday, March 17.

(*Before Mr.* JEFFREYS, *Chairman; Mr.* VAUGHAN DAVIES, *Sir* CAMERON GULL, *and Mr.* D. FORD GODDARD.)

WEYMOUTH GAS BILL.

This Bill, the object of which is to extend the limits of supply of the Weymouth Gas Consumers' Company, to raise further capital, and for other purposes, came before the Committee to-day.

Mr. BALFOUR BROWNE, Q.C., Mr. FREEMAN, Q.C., and Lord ROBERT CECIL appeared for the promoters; Mr. WORSLEY TAYLOR, Q.C., and Mr. RAM represented the Weymouth Corporation, who opposed the Bill. The Great Western Railway Company had also petitioned against the Bill, but had since withdrawn.

Mr. FREEMAN, in opening the case for the promoters, said the object of the Bill was to extend the limits of supply of the Weymouth Gas Consumers' Company, conferring further powers on the Company for raising money and for other purposes. He, however, would have to trouble the Committee with very few details. The main object was the raising of further capital; and this was now absolutely required, for the necessities of the Company. As to the proposal to extend the limits of supply, he thought the Committee would, after hearing the evidence, come to the conclusion it would be to the interest of all parties, including the Corporation, who were the only persons appearing against the Bill. It was necessary that he should very shortly narrate the history of the Company. It was incorporated by the Weymouth Consumers' Gas Act of 1867, and embraced the districts of Weymouth, Melcombe Regis, Wyke Regis, and Radipole. The share capital was £30,000, with an authorized loan capital of £7500. Up to that time, the supply of gas to the town had been in the hands of nominally a company, but really a private gentleman; and as the gas he supplied gave rise to considerable dissatisfaction in the borough, a movement was originated among the consumers which gave its title to the present Company. They desired that gas of better quality should be produced; and they started a Company to buy up the works and undertaking. When the matter came to arbitration, the new Company found that they had to pay a much higher price than they anticipated; and the result was that for a number of years they struggled on under extreme difficulties—finding it very hard, not merely to pay a dividend, but even to make both ends meet. They had to borrow money on very unsatisfactory terms, on the personal security of some of the Directors; and for many years this hard struggle continued. Eventually, by dint of good management and very strict economy, they overcame their difficulties, and placed the concern in a highly satisfactory condition—not merely to themselves, but also to the consumers of gas in the town of Weymouth and surrounding districts. The maximum price which they were entitled to charge under their Act was 4s. 6d. per 1000 cubic feet; and the illuminating power was fixed at only 14 candles. In 1875, the Company obtained power to raise a further

capital of £10,000, and borrowing powers to the extent of £2500. The dividend on the early capital of £30,000 was fixed at the usual 10 per cent.; but when they came for more money in 1875, they asked for 7 per cent. By this time, they had a total share and loan capital of £50,000. This had now to all intents and purposes been expended. Since 1884, the Company had paid maximum dividends, thanks to the good management, which, after a period of great difficulty, brought the concern into smooth water. The consumption of gas had very materially risen. In 1875, it was only 33 million cubic feet; while last year it was double that quantity. The Company had to serve a fixed population of about 20,000; while some 30,000 visitors came into the town and district during the summer months. There were 4000 houses in the town; but as gas was supplied to only 1300 of these at the present time, there was a considerable margin for developing the operations of the Company. The works, however, were already working to their full capacity. In the ordinary course of events, they would have had to apply for more capital to enable them to enlarge their works. The borough had recently been extended. New streets were constantly being laid out; and new mains were required to be laid down at once, if the Company were to continue to do their duty. The present Bill was promoted to meet this state of things; and the Directors at the same time asked to be allowed to extend the limits of their supply to Upway, Broadway, Preston, and Chickerell. As regarded these places, he had to mention that they were all on the borders of Weymouth; and when one passed out of the town, it was almost impossible to say when he entered the next parish—they were practically part of the district. They were rapidly developing; and residences were being constantly laid out. There was no opposition to the Bill from anybody in these districts. The extension would, as they believed, be a remunerative thing for the Company, and exceedingly beneficial to the town, which would have its approaches lighted up. To meet all these requirements, the promoters proposed to raise additional capital of £50,000, with borrowing powers for £12,500 in addition. With respect to the capital, of course it was not proposed to raise it all at once. There was in the Bill provision that not more than £10,000 should be raised during the first year, and not more than £5000 in any subsequent year. It was calculated that, having regard to what had to be done immediately, and to the growing requirements of the district, the capital would last for the ordinary period of from 15 to 20 years. As to the dividend, they did not propose to ask for even 7 per cent.; they would be quite content to take 5 per cent. as interest. They further proposed to apply the auction clauses to the whole of the stock and the debentures. There was another matter suggested in the Bill. It was proposed to follow a course which had lately been adopted in a great many cases, and to convert the whole of the stock of the Company into a stock bearing one rate of interest. They wished, in fact, to make the whole of their stock 5 per cent. stock. Thus their original share capital of £30,000, on which a dividend of 10 per cent. was allowed, would be equal to a 5 per cent. capital of £60,000; while the £10,000 of 7 per cent. stock would be equal to £14,000 of 5 per cent. stock. The advantage of the conversion would be, in the first place, to simplify the whole money arrangements of the Company; while, secondly, it would give an admirable chance to small investors—such as employees, and others interested in the Company—to advantageously invest their savings. This plan was approved by Parliament in four cases last session—viz., Cheltenham, Guildford, Ilfracombe, and the South Metropolitan Gas Company. In the last-named instance, the whole matter was argued out before a Committee, who were satisfied that it was an extremely convenient and useful form of arranging the stock. In addition to these proposals, it was actually intended to reduce the maximum price of gas to 4s. per 1000 cubic feet; and, at the same time, to raise the illuminating power to 15 candles. The 4s. was to apply to the inside districts only. For the outside districts (if added), there would be a differential charge which would bring the maximum up to 4s. 6d. per 1000 cubic feet. There was very little more to be said about the Bill. The Company proposed to supply gas ranges and stoves for cooking, which were generally in much demand at a place like Weymouth. There was only one other point he need touch upon. They asked power to apply their funds in an application for a Provisional Order to supply electricity, should they deem fit. This came about in the following way: There was a growing feeling among gas engineers that a gas company could supply electricity much cheaper than a new company, who had to start with entirely fresh plant; and they consequently suggested, under their Bill, that they should be entitled to apply their funds to the promotion of a Provisional Order for the purpose. This in itself would not enable them to supply electricity. They could not get a Provisional Order without the consent of the Board of Trade and the sanction of Parliament; and they could not apply even to the Board of Trade unless they had the assent of the Corporation. Their proposal, therefore, could not in any shape or way hurt the Corporation; and all they asked for was to be placed in a position to apply their funds for the promotion of a Provisional Order, should they deem it right to take such a step. No allegation was made either of mismanagement or neglect on the part of the Company. When they came forward to secure powers which they believed to be absolutely essential to the proper performance of their statutory obligations, they naturally expected that they would have received cordial support from the Corporation. They were therefore considerably surprised when notice was given of opposition to the Bill. In the first instance, they received a letter from the Town Clerk of Weymouth asking on what terms the Company would be willing to dispose of their undertaking; and to this the Company replied that they had no desire to sell. There never had been any feeling against the Company in the town. In the year 1887, permissive powers to purchase were introduced into a Bill then being promoted by the Corporation; but they were objected to by the Company, and eventually withdrawn. He now came to the grounds set forth by the Corporation in their petition, as to why the Bill should not go forward. The first paragraph he would call attention to was the fifth, where the petitioners objected to the proposed conversion of capital, on the ground that no good reason could be advanced for it; that it would not benefit the public, while the market value of the shares of the Company would be increased, and the capital value of the undertaking added to. Now his reply to this was that the object of the conversion was to offer a good investment for small capitalists.

Lord R. Cecil at this stage took up the opening. He said that, in addition to the reason already advanced by his learned friend in favour of the conversion, he had to suggest that the change would facilitate the accountant operations of the Company. Paragraph 6 of the petition raised the question of the reserve fund, and suggested that the conversion would enable the Company to greatly increase their reserve, and thus defer the time when consumers, under the provisions of the Gas-Works Clauses Act, would be entitled to a reduction in the price of gas. He could relieve the anxiety of the Corporation on this point, as the promoters were ready to insert a provision to prevent any increase of the reserve fund. Paragraph 7 opposed the extension of the Company's limits of supply; and suggested that they would not be remunerative, and could only be undertaken at the expense of the consumers in the borough itself. Now there was no reason why the Company should wish to obtain unremunerative powers; and surely, if they knew that an extension would prove unremunerative, they would not undertake it. As his learned friend had pointed out, it would be a great advantage to the borough to have the main roads in the neighbourhood capable of being lighted, especially as its population was an increasing one. A seaport like Weymouth, necessarily had growing suburbs; and it was a very rational thing that the Company should wish, in the course of time, to be able so to extend their limits of supply as to include these suburbs. In paragraph 8, the petitioners objected to the proposed increase of capital, as being by far more than was justified by the legitimate requirements of the Company. But there were many houses in Weymouth itself to which the gas supply had yet to be extended. The submission of the Corporation was that the money should be raised by way of loan, instead of being secured by the creation of new shares. Really, to his mind, this was the most amusing paragraph in the whole petition. The promoters would be able to prove, beyond all question, that further capital was absolutely necessary for carrying on the existing works; while if the limits of supply were extended, it would be still more necessary. As to raising the money by loan, instead of creating new shares, the promoters would, of course, be glad to raise as much as they could by loan. But it was the practice of Parliament only to allow a certain proportion of borrowed money; and the Company were asking for the full amount. Paragraph 9 was apparently based on a misconception, for though the present maximum price was 4s. 6d. per 1000 cubic feet, the Bill proposed that in future it should be 4s. in the town, and 4s. 6d. in the outside district. They were not therefore, as alleged in the paragraph, perpetuating a maximum of 4s. 6d. per 1000 cubic feet. The petitioners alleged that this maximum was higher than was justified by the cost of production; but he thought the promoters would be able to show such was not the case, especially as it was now proposed to increase the illuminating power to 15 candles. He believed they would also be able to show that the price of gas in Weymouth was lower than that charged by any other company in the county of Dorsetshire. The next paragraph complained that there was no proper testing-place, and suggested that one should be established in the Town Hall; but his reply to this was that the proper testing-place was at the works. Clause 12 was really the substantial part of the opposition. It set forth that the lighting of the borough should be in the hands of the Corporation. Now he had to submit that this was not a proper matter for the Committee to go into. If the Corporation wished to have the lighting in their hands, they should proceed in the ordinary way by Bill, when the whole question could be properly threshed out by a Committee appointed for the purpose. Such a proposal as to do it in the way suggested in the petition was, he was told by his leader, absolutely unheard of. Never before had any attempt been made to impose such a clause upon a company who were merely seeking for an extension of their limits, and for power to raise additional capital. He had to ask the Committee not to entertain any question on the subject. The Corporation were seeking to prevent the Company using their legitimate powers for extending their operations; and they endeavoured, in reality, to keep down the value of the undertaking in view of the fact that some day an opportunity might arise for them to purchase it.

Evidence was then called for the promoters.

Mr. *Rowland Thomas*, J.P., the Chairman of the Company, said he had resided in Weymouth 58 years. He possessed naturally a very intimate knowledge of the whole neighbourhood. The Weymouth Consumers' Gas Company was incorporated in 1867; and he was the first Director mentioned in the Act of Incorporation. Before that, the gas supply of the town was in the hands of a private gentleman named Burden. For some time prior to 1867 there had been considerable dissatisfaction with regard to the supply of gas; and consequently certain large consumers banded themselves together with the intention of forming a Company. They obtained parliamentary powers to carry on the undertaking as an independent Company. The capital was fixed at £30,000 in £10 shares, with borrowing powers to the amount of £7500. The limits of supply were to be the parishes of Weymouth, Melcombe Regis, Wyke Regis, and Radipole. The new Company soon found themselves subject to considerable financial pressure, for they had to pay a very high price for the old works. For many years, they had great difficulty in carrying on the concern and meeting their engagements. Indeed, the Directors offered to sell the works to the Corporation at cost price; but the offer was ridiculed, and they were told that as they had made a bad bargain they must stick to it. They did stick to it; and their Manager had now made the undertaking a success. In 1875, the Company were authorized to raise £10,000 by shares and £2500 by loan; so that the actual capital of the Company was now £50,000. The whole of this had been expended; and the time had come when, if the Company were to fulfil their statutory obligations, they must raise further capital. They proposed to convert their capital into 5 per cent. stock, to make it a convenient investment for small holders. Undoubtedly it would be for the convenience of the Company as well. They wanted to take power to apply their funds to promoting an application for a Provisional Order for electric lighting. They could, if they had power to supply the electric light, use some of their mains and plant for the purpose. The works to a certain extent were in good condition at the present time; but they were worn out by the hard work which they had had to do. They were not large enough; and it was absolutely essential the Company should raise additional capital; the Company had, in fact, reached the limits of their productive powers. There had been no complaints with respect to the gas supply. So far as he knew, the consumers were perfectly satisfied. The Company proposed in the Bill to make concessions to the consumers—reducing the maximum price in the town to 4s. per 1000 cubic feet, and raising the illuminating power of the gas to 15 candles. They had decided on the amount of

capital to be raised on the advice of experts. The consumption of gas was largely increasing; and witness thought it must necessarily continue to do so. It was proposed to include Upway, Broadway, Preston, and Chickerell in the limits of supply. The inhabitants would be very glad to have gas. Witness was of opinion that these extensions would be remunerative. The Company had no wish to sell their undertaking; and apart from the Corporation's desire to buy, witness saw no reason for their opposing the Bill.

Cross-examined by Mr. RAM: He could not see how the Corporation were injured. If the price of gas went up owing to the Bill, the consumers would suffer; but there was no chance of this taking place. They already had power to lay mains in Wyke Regis, and had supplied part of the parish for many years. The whole parish certainly had not been supplied.

Mr. RAM: Is there any such population in the outlying parishes to which you wish to extend your limits, to make it probable that such extensions can be carried out with advantage in the near future?

Witness: Well, I think it will be the case in the parish of Broadway, where there are two railway stations.

Do you intend to supply Preston?—Not in the immediate future.

How far is the village of Wyke Regis from Weymouth?—About two miles. So far, we have not found it profitable to supply this place, though we have had the power for years.

Are your present borrowing powers exhausted?—Entirely.

Have you had any experience of the transfer of gas-works to municipal authorities?—No. I do not know that gas could be produced more cheaply by those authorities.

At this stage,

Mr. FREEMAN asked the opinion of the Committee as to the right of the petitioners to raise the question of purchase in connection with the Bill. He submitted it could only be done in a Bill brought in for the special purpose; and he urged that it would be contrary to practice for Parliament to entertain it on the present Bill.

Mr. RAM contended that there were precedents for the practice in the Chesterfield and Ilfracombe cases.

Sir CAMERON GULL: No; not Ilfracombe.

The CHAIRMAN: Our opinion is that the insertion of a compulsory purchase clause in this Bill would be contrary to parliamentary practice. We cannot admit it.

Mr. RAM: I am asking not to be deprived of my rights if the Bill passes.

Mr. BALFOUR BROWNE: You are practically asking that we should be forbidden to oppose any Purchase Bill the Corporation might see fit to introduce.

The CHAIRMAN: We hold it would be contrary to practice.

Mr. BALFOUR BROWNE: I do not know of any precedent for tying our hands not to oppose a Bill before we know what it is.

Mr. RAM: I hope the Committee will be good enough to keep an open mind on this point until to-morrow morning.

Mr. *Malin*, Solicitor, of Weymouth, said he was interested in building land at Broadway; and he thought it would be a great advantage if the Company's limits were so extended as to include that parish. He could not see how it would be any disadvantage to the borough. Broadway was on the main road between Weymouth and Dorchester; and a large nu nber of villa residences were now being built.

Cross-examined by Mr. RAM: If the supply to Broadway, where there are only 203 houses, should not prove remunerative, would not consumers of gas in Weymouth suffer?

Witness: They might have to pay more; but I do not think they would.

The CHAIRMAN: Have you taken any means of ascertaining the feeling of the people there?

Witness: I know that the owner of land adjoining mine is in favour of it.

There has not been any public meeting?—No; I can only express my personal opinion.

Thursday, March 18.

When the Committee resumed consideration of the Bill this morning,

Mr. *J. G. Rowe*, J.P., was called. He said he had resided in Weymouth for 30 years. He was a costumier by trade, and a large employer of labour. He was a Director of the Gas Company. He was a large gas consumer; and he thought the gas was very good indeed in quality. The management of the Company was first rate; and the interests of consumers were properly considered, while the dividend was satisfactory to the shareholders. He had never heard of any serious complaints; and the Company had evidently done their best to meet the public requirements. The general feeling of the town in regard to the Company was one of satisfaction.

Cross-examined by Mr. RAM: No doubt, the people of Weymouth would like to get their gas cheaper. A large portion of Wyke Regis was served by the Company already. If the supply was extended to outlying places with unsatisfactory pecuniary results, he did not see how the people of Weymouth would suffer.

By the CHAIRMAN: In his public capacity of Chairman of the Board of Guardians, he had heard no complaints as to the quality of the gas.

Dr. *Simpson*, J.P., of Weymouth, said he had been a consumer ever since gas had been supplied by the Company, and before. The taking over of the works was certainly an improvement; and he was thoroughly satisfied with the quality of the gas. The Company acted most liberally; and he believed the general body of consumers were satisfied—he, at any rate, heard no complaints. He did not see how the present application of the Company would do any harm to the borough.

Cross-examined by Mr. RAM: He could not say that the present application would do any good to the borough. He believed that it would be inadvisable to go to Preston for some time; but a gradual extension to Broadway and Upway would be desirable. Chickerell was not a very promising district. Still, it was developing fairly rapidly.

The CHAIRMAN: What is the price of the gas?

Witness: 3s. 4d. per 1000 cubic feet, I think.

Mr. THOMAS: No; 3s. 8d.

Mr. RAM: Why is it inadvisable to extend to Preston?

Witness: Well, there is a long intervening beach. If too much is done in the way of extension, it might affect the price of gas in the town. As a member of the Corporation, he always thought the Company treated them liberally. The beach intervening between Weymouth and Preston was not very likely to be built on.

Mr. *Bartlett*, a builder and contractor, of Weymouth, said the Company had always met him in a fair spirit. He did not think they could be more popular. He was a large ratepayer, and was satisfied with the way in which the Company dealt with the town.

By the CHAIRMAN: He had no interest in the Company.

Mr. *James Lowe*, the Manager and Secretary of the Company, deposed that, during the 16 years he had been connected with the Company, the demand for gas had increased enormously. It had quite doubled. It was correct that the normal population of the borough was 20,000; the visitors raising the total to 50,000 in the summer months. Only 1300 out of the 4000 houses in the town were supplied with gas; but large estates were being laid out for building purposes in the newly-added portions of the borough. A new estate for 276 or more houses had been laid out on the Chickerell Road; and the Corporation were extending their drainage and laying out roads. Building, in fact, was extending in every direction; while Messrs. Whitehead's torpedo-works were in close proximity. These works would probably be supplied with gas; and forty or fifty houses were being erected for the employees at the works. On the same road, there were over a hundred houses, with an hotel. At the village of Wyke Regis, he believed there would be a large demand for gas. It was necessary to extend the works. During last December, the plant of the Company was being worked to its utmost powers, which was very undesirable—the demand, in fact, was rapidly outgrowing the power of production. They had insufficient coal storage. They brought their coal by sea; and in rough weather, the supply was sometimes cut off. To put themselves in a position to meet modern requirements, they must have additional plant; and some of the mains would have to be enlarged at once. They had always endeavoured to meet the wishes of the Corporation in regard to lighting, and had invariably laid mains in new roads. At the present time, they were putting down more than two miles of mains for public lighting. The sea-front was exceptionally well lighted; and though extra strong lamps were provided, no additional charge was made by the Company, who had in addition erected handsome columns. The present works were in good order; but what was wanted was an extension of them. He believed it would be of advantage to enlarge the limits of supply as suggested. It was not proposed to extend the mains, unless it would be remunerative. The extension would not affect the Corporation or the ratepayers. The capital asked for would meet their requirements for 15 or 16 years. The maximum price of gas would be reduced from 4s. 6d. to 4s. per 1000 cubic feet. The actual charge was now 3s. 8d. per 1000 cubic feet.

Cross-examined by Mr. RAM: They proposed to light parts of Wyke Regis when it could be done profitably. Negotiations were now pending with the Whitehead Company to supply them with gas. It would cost £750 to extend the mains to the works; and it was proposed to charge 5 per cent. on the outlay. But when the annual consumption by the Whitehead Company reached £350, the charge would be discontinued. Parliamentary authority was not required for the extension to Wyke Regis; but it was for raising the necessary capital.

Mr. RAM: I think not.

Witness said he believed the County Council would pay for the lighting of some of the main roads leading to these places.

The CHAIRMAN: The Parish Council would have to pay, if they put the Lighting Act in force.

Mr. RAM: But if they do not, the County Council will have to pay.

Mr. FREEMAN: The lighting is entirely under the control of the parish authorities. The County Council are only responsible for the repair of the main roads.

Cross-examination continued: The Company had exhausted every penny of their borrowing powers, and could not raise any more money. When they unified their capital, they would get further borrowing powers. He saw no objection to the insertion in the Bill of a provision as to exhausting their proposed additional powers of borrowing on existing capital before creating new shares.

Mr. FREEMAN: It is for me to say whether we accept such a limitation

Cross-examination resumed: He believed the proposed additional capital would be absorbed in 16 years, by reason of the great works being initiated by the Government and the Great-Western Railway Company in the district. £50,000 had lasted 30 years, including the cost of purchase, and all the initial outlay. If they were to go on at the same rate as this, the proposed additional capital would last 100 years. But they were going in for extensive additions. Their capital expenditure had been unduly contracted the last five years.

Mr. RAM: If you were not to extend, but go on as now, you could reduce the price of gas?

Witness: We cannot go on as we are; we must extend. We cannot be fossilized. Continuing, witness said a maximum price of 4s. per 1000 cubic feet in the borough was asked for. They did not ask for a sliding-scale. They did not want to increase their dividends; preferring to give all the benefit to the consumer.

Re-examined by Mr. FREEMAN: The object of the Company was to benefit the consumer. If they were to do their statutory duty, they must have more money and more works. The Corporation had never complained of the way the Company treated them.

The CHAIRMAN: Do you have complaints from ordinary consumers?

Witness: None of importance. He thought the sliding-scale usually worked to the benefit of the shareholder, and not to the consumer.

The CHAIRMAN: It is generally believed to act the other way.

By Mr. GODDARD: The Company allowed no discounts in 1888. The price was 3s. 10d. per 1000 feet; and in 1895 it was reduced to 3s. 8d. Slot meters had been adopted to a limited extent; but lack of capital prevented their extension as far as the Company desired.

By the CHAIRMAN: They did not get their coal cheaply, as freights were very high.

Mr. *W. A. Valon*, Consulting Engineer to the Ramsgate Corporation and to the Weymouth Gas Company, was next called. He went at length into the financial position and working of the Company. The increase of the last five years had been at the rate of 6·5 per cent.; but lack of capital had prevented the Company extending their supply to meet all the demands upon it. He thought that, in the course of the next few years, the demand was likely to increase. He based this statement upon his

comparison of Weymouth with Ramsgate and Margate, where the increase had been from 13 to 15 per cent. The proposed new capital would be subject to the auction clauses. The Company rather prided themselves on being a consumers' company; hence the proposal to fix the dividend at 5 per cent. instead of the usual 7 per cent. The premiums would go to the extension of works, and would be non-dividend paying. The original expenditure of the Company was exceptionally heavy; and this accounted for the apparently high cost of the manufacture. Though they were about to increase the illuminating power to 15 candles, they based their estimates on the ground that the cost of manufacture would be £500 per million cubic feet. The extensions asked for would not be undertaken unless it was believed they would prove remunerative. He thought these extensions were reasonable. The local authorities were satisfied with the conduct of the Company. Some two miles of mains, laid by the Company at the request of the authorities, were not remunerative. As to the new capital required, the Company would raise all they could by loan. The storage of coal was inadequate to the size of the works; and occasionally it was necessary to have recourse to the Railway Company, which was still more expensive.

By Mr. RAM: Anyone who knew Weymouth, Ramsgate, and Margate, would say they were precisely similar towns. The Ramsgate Gas-Works had been in the hands of the Corporation for many years. The Margate works belonged to a private Company; but both places showed a like increase of consumption. This was largely due to the introduction of penny-in-the-slot meters, which were applicable to small houses. After careful examination of Weymouth, he had come to the conclusion that there was room for an immense development of the slot system. He justified the large increase of capital, because there was £10,000 to be spent immediately on new works, and on the expected increase of consumption and necessary extensions. He was aware that Parliament did not like gas companies to be clear of the necessity of applying for further powers for more than 15 years; but with regard to this application, though it might relieve them of the necessity of coming to Parliament for a longer period, yet it should be remembered that the sole benefit of this Bill was to go, not to the shareholders, but to the consumers. As to the sliding-scale, in this particular case the Company were sacrificing the interests of the shareholders to those of the consumers by not adopting it. They did not wish to increase their dividends. His experience was that the sliding-scale usually slid upwards; and he thought it would be a mistake to introduce the principle in this case.

Mr. FREEMAN: They estimated that the capital asked for would not last more than 15 years.

By the CHAIRMAN: The capital of the Company was high. He had no doubt the price of gas would be reduced in Weymouth in course of time. The high charge which the Company now made was largely due to the difficulties of coal storage.

By Mr. GODDARD: The slot system was now extended from pennies to shillings and half crowns, for the advantage of better-class houses. The reserve fund was £3134; and it would only be used to make up dividends, and to meet certain extraordinary claims. One cause of the capital being high was that £10,000 had to be expended years ago on constructing a long subway to convey the mains from the works.

Mr. *Thomas Newbigging*, M.Inst.C.E., expressed his belief that the Bill was a fair and proper one in the interests of the consumers. The works of the Company were maintained in good order, but were worked up to the extreme limits; and extensions were urgently required, both of retort power and distributing plant. Not half of the houses in Weymouth were as yet supplied with gas, though all the capital powers of the Company were exhausted. The Company had to pay a very high price when they acquired the works in 1867. Everything showed that the undertaking had been exceedingly well managed. The use of gas for cooking was being popularized—particularly in sea-side places. The capital asked for was absolutely necessary; and it would enable the Company to go on for 15 years without coming to Parliament. The extensions proposed, though they might not be immediately required, would probably be needed in 10 years. The shareholders would suffer if unremunerative extensions were made; while the consumers would benefit from a profitable extension.

Cross-examined by Mr. RAM: He differed from Mr. Valon as to the sliding-scale. He held that it operated more in favour of the consumers than of the shareholders. He believed in five years they would have to produce 90 million cubic feet of gas; and the cost of extensions for this increased production would be £550 per million cubic feet. If they had no works, and had to begin from the very beginning, the cost would be between £600 and £700 per million cubic feet.

By the CHAIRMAN: He did not think the large increase of capital would help to raise the price of gas; an increased charge would probably lead to a loss of consumers. A large number of the houses in Weymouth were inhabited by a working-class population, who no doubt would adopt the prepayment meter system.

By Mr. GODDARD: If there were no extensions of supply required, it would be necessary to increase their capital. They must extend their manufacturing plant.

This concluded the case for the promoters.

Mr. *Morgan*, Surveyor and Engineer, of Weymouth, was the first witness called on behalf of the Corporation. He said he had held this post over twenty years, and consequently knew the district thoroughly. He admitted that the Gas Company treated the authorities well, and only charged them single price for the lamps on the sea-front which gave a double illuminating power; and that this had been done voluntarily, and without any request on the part of the Corporation. They had no complaint to make against the Company—they were happy enough as to the past, but were anxious as to the future. To reach Preston, the Company would have to lay 4147 yards of main; and along this road there were not more than three houses likely to take gas. The new main to Broadway would be 1317 yards long; that to Upway, 3800 yards; and that to Chickerell, 3906 yards. In all four places, there were only 830 houses, of which 532 were below the gross annual value of £8.

Cross-examined by Mr. BALFOUR BROWNE: In his opinion, it would not pay the Company to supply gas to those places.

Mr. BALFOUR BROWNE: Then what are you afraid of? Will it do you any harm if we have power to lay the mains and do not do it?

Witness: Certainly not.

Do you think the Company, whose object it is to make a profit, would lay mains which will not pay?—No; but they might do so under some circumstances.

Sir *R. N. Howard*, Solicitor and Town Clerk of Weymouth, who has practised there forty years, declared that it would be the most absurd thing in the world to extend the mains to Preston. Nor did he approve of the proposed extension to Chickerell. There were no prospects of profitable extensions for years; and therefore the Company did not want such a large capital. No building of any importance was going on outside the borough limits.

Cross-examined by Mr. BALFOUR BROWNE: Weymouth was a rapidly increasing borough. It was not the case that considerable building was going on at Upway, though it had been found necessary to lay down a public water supply there. He had been seven times Mayor, and retired from the Council to take the more powerful position of Town Clerk. He did not lead the people to oppose this Bill. The Company had done their duty well. He did not want to see their limits of supply extended. If the outside parishes became sufficiently populous, they should have an opportunity of starting their own gas-works.

Mr. BALFOUR BROWNE: Are you interested in gas enterprise?

Witness: Yes.

Then you are a gas company as well as Town Clerk?—Yes.

Where do you supply gas?—At Portland. I have been obliged to lay miles of mains there which are not remunerative, in order to secure the proper lighting of the district in parts which are remunerative.

So the public got the benefit of your philanthropy?—Unfortunately.

Mr. RAM: And we are anxious that the outlying districts should not be benefited at the cost of Weymouth.

By the CHAIRMAN: There was a strong feeling in Weymouth in favour of buying the works. The fear was that the proposed extension would prevent the further cheapening of gas in the town. The town wanted to buy not only the gas-works but also the water-works; and the delay in promoting Bills for the purpose was due to the necessity of getting rid of the Drainage Committee. They would get no help from the Local Government Board until that was done. They were now spending from £25,000 to £30,000 on drainage.

By Mr. VAUGHAN DAVIES: The rateable value of the borough was £87,000. The last six-monthly rate was 1s. 5d. in the pound. He could not say how much they would have to pay for the gas and water works; but he thought the public thoroughly understood what it meant. The purchase of the gas-works would not entail heavier rates; as they believed that, relieved of the necessity of paying high dividends, the town could be supplied with gas at a lower price.

Mr. RAM then addressed the Committee in opposition to the Bill. Having pointed out that by their decision he had been debarred from raising the purchase question by his examination of the witnesses, he said he had to ask them not to throw out, but to modify the Bill in certain particulars, so as to prevent the administration of the Company being carried on in any way calculated to injure the ratepayers of the borough. First he invited them to cut out the portions of the measure relating to extensions to the outlying districts. Surely there was ample scope in the borough itself for a development of the operations of the Company. By all means, let the Company be equipped with a proper amount of capital for this purpose; but they ought not to be empowered to lay miles and miles of mains through a purely agricultural country, from which there could not be any prospect of a reasonable return for years. It was all very well for the promoters to say that they would not lay the mains if it were likely to prove unprofitable; but there was this danger—that with an exaggerated capital, there would be a strong temptation to spend more than was absolutely wise, and the Directors might be mistaken in their judgment as to whether a proposed extension would prove remunerative. Let it be borne in mind by the Committee that there was no evidence of a desire on the part of the residents of the four parishes to have a gas supply. No public meeting had been held for the purpose; and surely if there had been any demand, evidence could have been produced. Then as to the enlargement of capital. Judging by past experience, the sum now asked for would be sufficient to obviate the necessity of the Company coming to Parliament for another 30 years; and this certainly was not a desirable state of things. He therefore asked the Committee to limit largely the proposed new capital. He understood that his learned friend agreed to the insertion of a clause providing that the increased borrowing powers now asked for on the old capital should be exhausted before any new capital was raised.

Mr. BALFOUR BROWNE: Yes; that has always been our intention. The clause will therefore do us no harm.

MR. RAM, in conclusion, asked the Committee either to reduce the maximum price for gas named in the Bill, or to fix a standard price under a sliding-scale.

Mr. BALFOUR BROWNE said his learned friend did not seem to be aware that the limits of the Company's supply already extended far outside the borough of Weymouth. The suggestion was that the extensions should be refused because they must prove unprofitable; but was it likely that miles on miles of mains would be laid down unless some return could be seen for it? The Committee would bear in mind the fact that his clients were not bound to lay the mains at all; but if the population had doubled, as was suggested, why should the power not be granted to them? What did the Broadway people say? They looked for an opportunity of lighting the parish with gas; and they hoped that gas would be brought to them. Before they could do injury to the borough, the Company—who had a perfectly clean record—would have to do injury to themselves. But if there was a reasonable demand for gas in the adjoining places, why should it not be supplied? The more money his clients could make outside Weymouth, the greater would be the advantage to the town, which would the sooner be entitled to a cheaper supply of gas.

The CHAIRMAN: Will you give your reasons for extending the supply to Preston. Your own witness said it was not wanted there.

Mr. BALFOUR BROWNE: I believe the main would be very easily laid, though I admit Preston is rather a long way off.

The CHAIRMAN: Supposing that the limits were not extended to Preston, but that the parish authorities wished Preston to be lighted by gas, could this be done without the granting of statutory powers? I mean, supposing that Preston afterwards wanted gas, and applied to you to have an extension made, could it be done?

Mr. BALFOUR BROWNE: No; because we could not lay one inch of

mains in Preston. Preston would have to bring their mains down to our boundary. I admit that our case, so far as Preston is concerned, is not a very strong one; but in proposing to extend our limits, we thought it well to take powers for this as for the other surrounding districts. I agree with the Town Clerk that no gas company would probably at the present moment lay a main to Preston; but what harm could be done by giving the powers asked for?

The Committee deliberated for some minutes, and

The CHAIRMAN then announced that they did not think the promoters had made out their case for extending their operations to Preston and Chickerell. They were prepared to grant the Bill so far as it related to Broadway and Upway; but they thought with this limitation, the capital ought to be reduced by £10,000—leaving a share capital of £40,000.

The Bill was then amended by the striking out of the Chickerell and Preston clauses, and by the reduction of the borrowing powers; and in this form it was passed by the Committee for report to the House.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Thursday, March 18.

(*Before the* MASTER OF THE ROLLS *and Lords Justices* LOPES *and* CHITTY.)

Corporation of Southport v. Birkdale Urban District Council.

This was an appeal by the Birkdale District Council from the decision of a Divisional Court, consisting of Justices Wills and Wright, on a case stated by the Magistrates of Birkdale who had convicted the Corporation of Southport for supplying gas below the illuminating power prescribed by the Southport Improvement Act, 1871. Their Lordships in the Court below held that the Corporation were not bound to supply gas of the power stated—viz., 20 candles; and they accordingly set aside the conviction. (See "JOURNAL" for Dec. 15, 1896, p. 1189.)

Mr. BIGHAM, Q.C., and Mr. HORRIDGE appeared for the appellants; Mr. MOULTON, Q.C., Mr. BRYNMOR JONES, M.P., and Mr. S. EVANS represented the respondents.

Mr. MOULTON at the outset raised an objection that the Court had no jurisdiction to hear an appeal in this case, which he contended was a criminal one to all intents and purposes.

The MASTER of the ROLLS: Do you say that the Mayor and Corporation are criminals?

Mr. MOULTON: They are criminals for the purposes of my argument that, this being a case where there has been a conviction and a penalty enforced, there is no power of appeal.

Lord Justice LOPES said he supposed that, if the penalty had not been paid, there could have been imprisonment.

Mr. MOULTON said there was the fact that the defendants were a Corporation, and they could not very well be sent to prison. They had been convicted and fined in a Police Court, before five Justices of the Peace, under sections 39, 40, and 41 of the Southport Improvement Act; and, this being so, there could be no appeal from a Divisional Court on a special case stated for its consideration.

Mr. BIGHAM thought Mr. Moulton was altogether wrong in describing the Mayor and Corporation of Southport as criminals. They had, it was true, been fined £10 by the Magistrates; but the fine did not, as in a criminal case, go to the Crown. It was really money forfeited under a Private Act; and it could be recovered by civil process under the Summary Jurisdiction Act.

The MASTER of the ROLLS, in giving judgment, said he was of opinion that the objection as to this case being in the nature of a criminal matter must prevail. The Corporation failed to comply with certain obligations put upon them by Act of Parliament with regard to the quality of the gas supplied; and the Justices ordered them to forfeit £10 with costs. In order to obtain this decision, an information was laid before the Justices, asking for a conviction. The conviction was in regard to a criminal matter; and the Court of Appeal had no jurisdiction to hear any appeal in a case of this kind. The appeal must therefore be struck out, and the preliminary objection sustained, with costs.

Lords Justices LOPES and CHITTY concurred.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, March 16.

(*Before Mr. Justice* ROMER.)

The Automatic Coal-Gas Retort Company, Limited, v. The Mayor and Corporation of Salford.

This was an action brought to restrain an alleged infringement by the defendants of the plaintiffs' patents.

Mr. MOULTON, Q.C., and Mr. WALTER appeared for the plaintiffs; Mr. BOUSFIELD, Q.C., Mr. ROGER WALLACE, Q.C., Mr. ASTBURY, Q.C., and Mr. ROE RYCROFT represented the defendants.

Mr. MOULTON, in opening the case, said the invention for which the patent in question was taken out was one which had produced, so far as it had been adopted, a most extraordinary change in gas manufacture. With the old style of retorts, they had a most interesting scene at the time of charging them. The retorts were all horizontal, and double ended, so that they could be charged half from one end and half from the other. They were charged by filling a long scoop, half the length of the retort, with crushed coal; and then the men supported it on their shoulders, one at either end, and it was thrust into the retort, turned over, and brought out again. The work had to be done at great speed, and was very trying to the men; and yet, though it was so, and was expensive as well, this method had held its own, because it was the only one until the plaintiffs' invention was made. This gave proper results from the carbonization of the coal. In order to explain its merits, it would be necessary to point out some of the dangers in connection with the improper stoking of the retorts. Gas was made by the destructive distillation of coal; and when this was exposed to a great heat, all sorts of hydrocarbons were liberated. Some of these were gaseous and some were not. For instance, the tar went off with the liquor; and there was left behind a great deal of coke, which was nearly pure carbon. The resulting gas differed very much in value according to the type of hydrocarbon produced. The hydrogen itself had very little illuminating power; and the larger the proportion of carbon, the greater was the light-giving value. Therefore they wanted to get a large portion of heavy carburetted hydrogen. When these hydrocarbons were formed, they too were liable to destructive distillation; and if they were passed through a glowing mass of coal, they would deposit their carbon, and escape probably as marsh gas. All heavy hydrocarbons were liable to drop their carbons in great heat. The old kind of retort made the gas generated within it force its way through a mass of glowing coal. Therefore proper stoking was of very great importance. This could be obtained by hand; but there was no mechanical method of stoking before the plaintiffs' patent. It was said that there were some methods of actuating the scoops by hydraulic power; but his Lordship might take it that there was no automatic one, of the type about which he was going to speak, before the date of the letters patent in question. Many people had had the idea of stoking automatically by throwing the coal in some cases into vertical retorts. The consequence would be that the retorts would fill up. As the coal was hot, the gas would come off, and pass through a long column; and only at the top would it get away—having had to run the gauntlet of the great mass of glowing coal, and depositing its carbon in doing so. The patentee in the present case hit upon the successful mode of using a device which he (the learned Counsel) was certainly very incredulous about when he first heard of it; and he thought his Lordship would be equally so. But it had been found to work with such perfect success automatically that he believed only one man was required for attending to the retorts where three used to be necessary. The patentee, having conceived the idea of an inclined retort stoked from the top end, associated with the idea the discovery that by so doing, if he chose rightly the exact slope for the retort, so that it corresponded to the angle of repose of the coal, he would be able to shoot it in, and cause it to lie right along the bottom of the retort—making a layer of uniform thickness all through. What was the consequence of this? The coal, when it gave out its gas, allowed the gas to pass at once into the upper half of the retort, so that it instantly went up through the pipes which drew it off. It was thus conveyed away undenuded of any of its valuable carbon. The plan had another advantage. It became perfectly easy to draw out the coke when the gas was made, because the retort could be opened at the bottom, and the coke had only to be just touched to cause it to gradually slip out without rakes having to be used. It was really an astonishing thing. One looked at a long sloping retort, and saw the coal rushing in; and by the time it reached the top of the retort one uniform layer covered the bottom, as level as if it had been raked over. When the charge was to be drawn, a man opened the lower door, lightly touched the coke, and down came the whole of it of itself; leaving the retort perfectly clear ready for the next charge. The retort was charged in about seven seconds; and it took about thirteen seconds to empty it. The patent had led to a system of the greatest simplicity for working retorts. Along the level of the upper part of the retorts there were the coal-trucks travelling and carrying the coal. The spout which led to the top of the retort had the proper charge of coal put in, a door was opened, and in five or six seconds the retort was charged as well as if it had been done by hand. The cost of carbonizing had been brought down to less than half what it formerly was; and the amount of labour was reduced to less than one-third.

The learned Counsel then asked his Lordship to accompany him to a consultation-room, to see a model of the arrangement work with powdered coal; and his Lordship left the Court for the purpose. On returning,

Justice ROMER said the essential part of the idea was that the slope selected was practically the slope at which the coal would lie.

Mr. MOULTON said that was so. The learned Counsel then took his Lordship through the complete specification relied on, which was applied for by M. Coze, the Manager of the gas-works at Rheims, France; and he said he did not think there was any question of disconformity. The patentee stated that the object of his invention was to effect the charging and discharging of retorts by using the phenomenon known as the angle of repose, and that the natural fall of coal should be sufficient to allow its distribution parallel to the bottom of the retort. He (the learned Counsel) did not believe that, from end to end of the whole book of specifications put in by defendants as anticipations, there was a suggestion that they could get coal in such a position as to form a uniform layer. One of the things relied on by the defendants was an alleged prior user. The learned Counsel then referred his Lordship to the "JOURNAL OF GAS LIGHTING" for Aug. 6, 1878 (p. 207), containing a paper read before the British Association of Gas Managers in that year by Mr. W. T. Carpenter, of Sheerness, describing his arrangement of retorts for the carbonization of coal. This was, he said, the only suggestion of anything in the nature of the plaintiffs' patent that had been put to work. In a picture bound up with the book of anticipations, his Lordship would see that at the top of the inclined retorts there was an archimedean screw—an ordinary propeller screw—and coal was charged in by this means through the narrower mouth of the retort; and the way in which it was worked was that the coal was driven into the retort. This completely filled the small retort, and kept back the gas. The first idea was to drive in the coal by means of the screw jamming up the mouth, and pushing the more or less caked charge through the retort. It would not surprise his Lordship to hear that this was tried and abandoned. There was not the faintest suggestion in this process that the coal would launch itself into a layer at the bottom of the retort. There was absolutely no user of the same means as the plaintiffs employed, beyond the inclination of the retort. This was the only prior user suggested. It was twenty years ago; and the thing disappeared because it had not the elements of success in it. The dates of the alleged anticipations of the plaintiffs' patent ranged from 1798 to 1878; and it was a very strong fact that the defendants could not suggest anything later than the latter year. Beyond the one he had mentioned, none of the patents had ever been in use. He had been through the whole of the anticipations; and he came to the conclusion that there was only one that merited notice. That was

Carey's patent (No. 1727 of 1864) for calcining and revivifying animal charcoal for the purposes of filtration. Carey thought of using an inclined retort for this purpose; and he fed the retort from the top. The case for the plaintiffs in respect of this patent was that, in animal charcoal and in calcining bones, not one of the requisites necessary for dealing with coal was required. Carey did not give any thought to the gas, except that he had better burn it before it got into the air, or else his neighbours would have something to say. The probability was that the angle at which Carey chose to work was one which would fill his retort up. He never suggested that by his method he could get a layer of stuff along the bottom of his retort of uniform thickness. He never thought of the difficulty which existed with regard to coal—that if they did not succeed in getting the layer independently of the top of the retort, they spoiled the gas. Carey's was an exceedingly good retort for doing its business, though he (the learned Counsel) did not understand that it was ever used. No practical gas man, even if he read such a thing as Carey's specification, would learn that it would meet the special difficulties which had to be dealt with in the destructive distillation of coal.

Justice ROMER asked what Carey said about the angle.

Mr. MOULTON replied that he described his invention as laying and setting an inclined retort so as to allow the contents to run down by their own gravity. That would be to an angle of 32½ degrees. He submitted to his Lordship that no one reading the specification would have learned that he could have treated coal satisfactorily in that way. The principle was: Did the specification of Carey tell the public that they could make a satisfactory automatic stoking coal-gas retort by this method? The utility of plaintiffs' invention could not be denied. The retorts were working successfully, and were being adopted very largely in England. The Gas Companies had the most absurdly conservative tendencies. They were slow at taking things up, and very firm in holding on to them; but the merit of the plaintiffs' method had now been recognized. The Gaslight and Coke Company had between 800 and 900 of the retorts fitted. The South Metropolitan, Brentford, Birmingham, Huddersfield, Manchester, Rochdale, and a great many other gas-works had the retorts; and his Lordship would have no difficulty in coming to the conclusion that it was a most admirable invention, saving a great deal of labour. He did not think the question of infringement would give a moment's trouble. The defendants' retorts were at the same angle as the plaintiffs'; and the only difference was that the defendants' appeared to be, to his mind, a little more clumsy, though he did not say they were not good retorts. The plaintiffs said they were the first to teach the public how to do what they had done; that even the paper anticipations failed to show that it could be done; and that the invention therefore was novel and useful, and had been infringed.

The following evidence was then called:—

Mr. *Dugald Clerk*, Assoc.M.Inst.C.E., said he had for some years made himself acquainted with the methods of producing gas from coal. Prior to the date of the plaintiffs' patent, the ordinary way was to charge a horizontal retort with coal in a uniform layer along the bottom, and subject it to distillation. It was absolutely essential for efficient gas production that the coal should not occupy the whole of the retort. The mass of coal in the retort became pasty and expanded. If the layer was thick, the resulting gas would be weak in illuminating power. When the retorts were charged by manual labour, a long scoop was used, the retort was opened, men advanced with the scoop filled with coal, pushed it in, turned it over, and withdrew it. It took a considerable time to charge a retort. With the old horizontal retorts, the process adopted after carbonizing had taken place was that the coke was raked out. This task was a laborious one. He had read the specification of M. Coze, which was being sued upon. There was one process described in the specification, with several modifications. The retort referred to had a bend in the mouthpiece, and the upper cover was horizontal. The bend in the vertical neck was to be so shaped as to produce a certain velocity when the coal was put into it for charging the retort. One modification extended the bend up to the top. In another, the patentee showed straight retorts, with a cover at the end and a moveable connecting piece. This was the modification now used.

Mr. ASTBURY remarked that the defendants were only being sued for infringing the first claim; and they said the modification referred to by the witness was in the third.

Mr. WALTER said the plaintiffs told the defendants last October that they were going to rely on claim No. 3.

Mr. ASTBURY said the plaintiffs were informed that they would only agree to that on terms which had not been accepted.

Justice ROMER said he would allow an amendment, if necessary.

Witness, in further examination, said one of the figures attached to the specification showed a truck running on rails, and a mouthpiece. The truck was brought along to the retort mouth, the mouthpiece was fixed, and the contents of the truck were discharged into the retort. The operation of discharging was performed by simply removing the retort cover, and taking away the stop; and then the slightest touch would make the whole of the coke fall out. The invention was extremely useful as it made it possible to do with eight men what before took 26; and it reduced the cost of carbonizing a ton of coal from 3s. to 1s. 2d. He had no difficulty in finding out what the invention consisted of.

Justice ROMER: Do you think that anybody following the specification, and possessing ordinary knowledge, would have any difficulty in finding what the invention is?

Witness: No difficulty at all.

Mr. WALTER next proposed to deal with the article which appeared in the "JOURNAL" in 1878, when

Mr. ASTBURY said he thought it would be better to do that in cross-examination.

Witness further deposed to having visited the Salford Corporation Gas-Works. He said he had inspected the retorts and the method of charging them. They had an arrangement of conveyers for taking the coal up to the top of the retort-house, and it was then put into a large hopper which was in the middle of the retorts. There were rails carrying moveable hoppers; and these on running to the large hopper received a fixed charge of coal. The moveable hoppers, with three charges of coal each, ran to the retorts, and charged them. The angle of the retorts was 32°; and there was no material difference between the defendants' and the plaintiffs' retorts. The coal would fill up 5 or 6 inches of the retorts, which were 13 inches deep. He was unable to point to any distinction between the plaintiffs' and defendants' retorts; certainly there was no essential difference. The charging and discharging operations were the same in each. He had read the anticipations relied on by the defendants, and he was unable to see in any of them the invention disclosed by the plaintiffs' specification.

Wednesday, March 17.

Mr. *Dugald Clerk*, in cross-examination by Mr. BOUSFIELD, said he did not suggest that the plaintiffs invented having an even layer of coal over the bottom of the retort; that had been the universal practice in horizontal retorts. He had seen 200 of the plaintiffs' inclined retorts at work. The actual angle in some retorts was 32°. The idea of having an inclined retort was old; and the utility of them in practice depended upon having a good system of distribution of the coal. The plaintiffs proposed having the retorts at an angle slightly less than the angle of repose, and utilized the fall of the coal together with the angle of repose. The real purpose was to prevent the entering fuel from rolling on itself. To get the right angle for practical purposes, was essential.

Mr. BOUSFIELD: You have already said that the placing of these retorts at the proper angle is essential to the success of the plaintiffs' invention. Now I put it to you that the direction to make your angle less than the angle of repose, and to shoot the coal down the shoot and round a bend, as shown and described in plaintiffs' specification, is a direction which would lead to failure instead of success?

Witness: Oh, no.

I put it to you that the condition of success is to have an angle greater than the angle of repose, and to let the coal slide down with as small an initial velocity as possible?—I do not agree with you.

Witness (continuing) said that for practical success, they had to be prepared to deal with various conditions—they could not always have the same nature of coal, or the same amount of friction; but they got the same size. There was something in the specification which enabled him to modify the arrangements, so as to deal with different kinds of coal. In fig. 14 of the specification, arrangements were made for dealing with any size of coal; and any velocity could be got that was required. The velocity was depended on more than the fall. If a great rush of coal was allowed to fall from the hopper, they would find they would get a heap at the bottom of the retort. The plaintiffs told them to get a uniform layer. The difficulty of any size of coal would be overcome by opening the slide more or less gradually.

Mr. BOUSFIELD: Have you ever seen erected retorts made according to fig. 1, relying on the tipping of the trucks at different speeds for getting a proper distribution?

Witness: I have never seen fig. 1 at work; but I know that it has been erected and worked for years. There were troubles with it.

Mr. BOUSFIELD asked whether it was a fact that at Kensal Green 416 retorts like fig. 1 were put up; and that after a short time, they were disused.

Witness replied that he was aware of that. Nine Elms was a similar case; but Southall was, he believed, successful. He did not know that at Birkenhead 28 retorts were put up and worked for seven months, and then disused.

Mr. BOUSFIELD: I put it to you that the directions in the specification, to have your retort at a little less angle than the angle of repose, and to shoot your coal down on to it, has been a failure?

Witness: I do not agree with you. At the very works you have mentioned, the retorts have worked efficiently so far as the charging was concerned.

The success achieved has been entirely due to discoveries made since the date of the specification?—I do not think there are any retorts like fig. 1 at work in Britain; but there are some in France. Witness added that the angle of the retorts directed in the specification was little else than the angle of repose; but it also told them that the coke was to slide out.

Mr. BOUSFIELD suggested that the directions given to effect it would not do so. Having regard to the fact that they had to drop the coal from a height, they had to make the angle still less.

Witness did not agree. In practice, in order to get an automatic discharge, they had to make the angle greater than the angle of repose of coal on clay. Possibly it would work better if the discharge was greater; but the slightest touch would bring the coke down. There was a very wide limit in which the invention could be employed. The angle used was 32°; and that might be a little greater than the angle of repose of coal on clay.

Mr. BOUSFIELD directed witness's attention to the mode of working defendants' retorts, and said the coal was delivered into a hopper with a mouth at the bottom and a door that would open. This door was so placed that, when it was opened, it was at about right angles to the shoot, which was of the same inclination as the retort, and was placed in line with the retort, so that when the door was opened, the coal struck the shoot at right angles. In some cases, the shoot actually delivered the coal at such an angle that it tended to make the coal run up the retort instead of down. Was not the endeavour of the defendants' apparatus to deliver the coal in such a way that the initial velocity was destroyed?

Witness replied that in some instances it might destroy part of the initial velocity. In all cases in the defendants' system the coal was delivered to the shoot precisely at the same distance from the retort. The defendants opened their door at different angles according to the size of the coal used. The largest size was 1½ inch nobs; and then the door was opened 6 inches. The effect of this was to deliver the coal dead on to the incline; and then it would drop down of its own gravity. The effect of putting in small coal with the door open 6 inches would be to get a thin layer of small coal, and a big heap of larger coal. With small coal, the door would be open about 10 inches—small coal requiring a larger velocity than large coal. If the door was open 12 inches when large coal was used, the bottom of the retort would be filled up.

Mr. BOUSFIELD suggested that the practical success of the method in the use of inclined retorts depended entirely upon the method they used for distribution.

Witness agreed that if large coal was admitted at a high velocity, a heap would be formed at the bottom; and if small coal was admitted at too low a velocity, they would get a layer at the bottom and a heap at the top. He did not agree that the particulars required for the practical

success of the plaintiffs' invention were entirely wanting in their specification. The idea of inclined retorts was quite old. In the prior specifications relied on by the defendants, he found suggestions for inclined retorts, for hoppers and shoots for feeding, and for trucks running on rails to bring the coal up to the mouths of hoppers and deliver it. But he did not discover any direction, or any statement that they intended to produce a uniform layer of coal in the inclined retort. No one of them said anything of the kind; and it was not in the mind of the inventors to so produce a uniform layer.

Mr. BOUSFIELD took witness through the various specifications relied on as anticipations, and asked whether what defendants had done was to supply practical details for working on the lines of the old patents.

Witness said he did not agree with that; but it was for his Lordship to decide.

Mr. WALTER contended that the defendants simply copied the plaintiffs' invention.

Mr. BOUSFIELD said the plaintiffs desired to say that, even if the defendants did not come within claim 1 of the plaintiffs, yet they took one or other of the arrangements of claim 3.

Justice ROMER did not think the learned Counsel need ask witness that.

Witness (continuing) said that in the "JOURNAL OF GAS LIGHTING," August, 1878, there was a picture of a retort inclined at an angle of about 30°; but there a screw was used, and the coal was put in the retort in a pasty condition. This was a continuous action; but the coking was finished in a large chamber. The angle was the same as plaintiffs'; but the writer in the "JOURNAL" did not depend on the angle.

Re-examined: As a practical retort-charger, he found the plaintiffs' arrangement consisted of a coal vessel, a shoot connecting the coal vessel and capable of being inserted into the mouth of the retort, a retort inclined at a suitable angle, and a stop at the bottom of the retort. The invention contained all the essentials required to make a practical retort-charger. These things were to be found in the defendants' retort-charger; and they acted in the same way. Each portion of coal, as it fell into the retort, formed a stop for each succeeding piece of coal; the stop moving up the retort as the charge fell. The directions given by the patentee as to the angle to be adopted were suitable. He found clearly described the condition the coal was to assume when let into the retort. The charging appliances used by the defendants consisted of a charging mouth let into the mouth of the retort when open. Except in mechanism, there was no essential difference between the plaintiffs' and defendants' chargers. There were no difficulties to be found in charging a retort made according to fig. 1. In practice, it was a fact that both the plaintiffs' and defendants' appliances were fitted with levers which regulated the flow of coal from the truck into the retort. Neither the specification of Newton nor of Carey disclosed the plaintiffs' invention, and would not teach anyone the plaintiffs' invention.

Mr. *Edmund H. Stevenson*, M.Inst.C.E., was then called.

Justice ROMER asked how many experts were to be called. He did not think the parties ought to have more than two on each side.

Mr. WALTER said he was going to have a second expert to give very short evidence; but he had also several gas engineers.

Mr. *Stevenson* stated that he had made himself acquainted with the patent sued upon. He had also visited the works of the defendant Corporation, and inspected them. He had followed the evidence of Mr. Clerk; and he agreed with the description of the specification given. The suggestion that difficulties would arise in the working of plaintiffs' apparatus, in the variation of the height of the charging shoots, was not well founded. He had seen the retorts charged at Brentford, where there was a variation. He had also seen apparatus constructed under fig. 1 at the South Metropolitan Gas Company. There the inclination was some 36°. He saw the coal pass through into the retort; and it went down in a perfectly even layer. No one with ordinary knowledge would have any difficulty in constructing apparatus according to the plaintiffs' specification. Nobody ever attempted to do what the plaintiffs' had done—that was to say, to charge the retort at once the whole length with the full layer of coal. In the defendants' apparatus, the essential features of plaintiffs' invention were present. It was practically the same, with only a little variation in detail. The chief feature which the defendants had adopted was fixing the three charging mouths upon one vessel, and travelling with the three charges of coal on the top rails. He saw the retorts charged at Salford. In his professional experience, he had become acquainted with all improvements for stoking gas-retorts. He had read the specifications relied on as anticipations; and he could not have imagined the invention from any of the specifications. The experiments which had taken place in past years, by which a great deal of money had been lost, had brought all systems of automatic charging into disrepute. There had been a very large number of such inventions; but not one of them had been successful till the plaintiffs'.

Cross-examined by Mr. ASTBURY: He did not think one of the objects of the patentee was to get the mouths of the shoots all on a level; but they were all brought to one level in the figures in the specification.

Justice ROMER: Are you going to contend that this would get you out of the patent?

Mr. ASTBURY: We say that the essence of the specification was the bringing up of the mouths to one level.

Justice ROMER: Well, I am surprised. You might just as well say that it was the essence of the invention that the trucks should run on the rails at the same level as the mouth of the shoot. It is the smallest possible point.

Witness (continuing) said that given the idea as shown in the plaintiffs' invention, it was not difficult to carry it out. Since the patent had been brought out, there had been numerous patents for charging coal into retorts. In the specification, there was no mention of a door to the trucks; but any engineer would imagine that there must be one. The shape of the truck would convey that to his mind. Unless there was a door, some means would have to be employed for regulating the stream. There was not a word in the specification that there was to be a door. In fig. 14, the specification said the truck could be used for filling one or more retorts. He was quite as emphatic as Mr. Clerk in his opinion of the prior specifications.

Mr. *W. H. Y. Webber*, on the staff of the "JOURNAL OF GAS LIGHTING," in answer to Mr. WALTER, said he had had many years' experience as a gas engineer, and had erected a great deal of gas plant. He well remembered the introduction of plaintiffs' invention into this country; and he went to see the plant erected at Kensal Green, similar to fig. 1, but somewhat modified. In all essentials, it was Coze's patent pure and simple. The difference was that, instead of being built in, there were air-holes. He saw the retorts charged and discharged.

Justice ROMER said he did not take this evidence as identifying for all purposes.

Witness (continuing) stated that he knew fig. 1 of the plaintiffs' specification. The retorts at Kensal Green had the vertical prolongation built in, and attached to the retort. The coal was tipped in from a travelling truck, described as Coze's. He looked into the retort; and he saw that the coal was arranged in a uniform layer over the bottom of the retort from end to end. In the process of discharging, the bottom lid was taken off. The charge was touched with a light rake, very different from what had been used before; and the whole of it came out. The processes of charging and discharging were perfectly successful. He had read the specifications, and was generally acquainted with them; and so far as he knew and had read, there was nothing in them resembling the plaintiffs' invention.

Cross-examined: The apparatus at Kensal Green was new. He should think it had been up some months. He did not know that when it had been working a very short time it proved to be a failure, and was taken down. He did not like the buried-in cast-iron shoe, and said so in the "JOURNAL" at the time.

Re-examined: He had no doubt whatever that the charges at Kensal Green were perfectly normal ones.

Mr. *J. Husband*, an Engineer of the Brentford Gas Company, said he had six years' practical experience of inclined retorts at Brentford. All the coal there was carbonized according to the plaintiffs' process. There were three shoots in the retort building; and the thing worked perfectly. There were seven men and one boy engaged in charging and discharging the retorts, whereas it used to take twenty-four men and two boys to do the work; while the cost per ton of coal carbonized was 1s. 2d., as against 2s. 10d.

Cross-examined: Mr. Frank Morris was the Chief Engineer of the Company he was engaged with; and Mr. Van Vestrant was with the Company till 1889. These two gentlemen took out several patents for improving Coze's system. The apparatus erected at Brentford was the improved Coze. A baffle plate had been put in the shoots; and it was found that the work was done better. He did not know that the plates were put in in consequence of Van Vestrant's patent.

Thursday, March 18.

Mr. *Husband*, in further cross-examination by Mr. ASTBURY, said the length of the retorts at Brentford was 20 feet; and they were placed at an angle of 31°. Every one of the slides had baffle or check plates fixed. Prior to the fixing of these plates, the charge of coal went down to the bottom of the retorts.

Mr. ASTBURY informed his Lordship that the defendants suggested that, without the baffle-plates, the charge of coal went down in the form of a layer of some kind at the lower half of the retorts.

Witness said it was most important, in the manufacture of gas, that the layer of coal in the retorts should be thin, and should extend from the top to the bottom of the retort; but before the baffle-plates were put in, the layer of coal might not have extended all over the retort. At Brentford, a lever was put to the door of the measuring chamber, in order to check the velocity of the coal. This lever was the result of practical working. He had no data which would give the amount of gas produced under the different circumstances at Brentford. The Brentford Gas Company held a licence under the plaintiff Company; but he could not tell under what patent it was. They had never used the transverse door system. Van Vestrant's patent of 1892 showed a baffle-plate like that inserted at Brentford. They did not use the plate now, they had an eccentric; but this had the same operation.

Mr. ASTBURY directed witness's attention to a paragraph in a pamphlet issued by the plaintiffs in 1890, headed "Morris and Van Vestrant's System," in which it was said that previous settings of inclined retorts had failed through the coal not being distributed in an even layer, or else filling the area of the retort in some place. Did this accord with his experience?

Witness replied that he had worked with Morris and Van Vestrant's system of checks; and without checks the coal was not so evenly distributed as with them.

Mr. ASTBURY: Is it a fact that if you do not use these checks with a certain class of coal, the long shoot down the vertical mouth sent the coal right down the retort?

Witness: If you did not have a valve, I daresay it would.

If it does that, you have the danger of expansion and bursting?—Yes.

Witness further said that it was not customary to have a skilled workman to operate the truck or other vessel through which the coal was shot into the mouth. An ordinary unskilled workman was employed.

Mr. *W. Bugby*, the Manager of the Southall works of the Brentford Gas Company, deposed to inclined retorts being first introduced into the works in 1890. They were on the Coze system, and had an angle of 30°. Twenty-eight retorts were so installed; and they worked for 450 days. They were then reset, and worked for another 500 days, up to March, 1895. The coal was charged by a tipping-charger on wheels. He had seen the retorts charged many times; and they worked very satisfactorily—the coal being fairly even over the floor of the retort. The discharge was also satisfactory. In 1891, fourteen more sets of retorts were put in, at an incline of 36°; and they were charged with a hopper having a moveable gate. In 1892, twelve more sets on the same principle were fixed—making altogether 208 retorts. The retorts were satisfactory in regard to gas production.

Cross-examined by Mr. WALLACE: All the retorts were not made entirely on the same system. In those fixed in 1891 and 1892, there was no fall from the hopper into the retort, as the hopper was on the same level as the retort. In the first system, there was a fall. It was for the purpose of discharge that the angle was increased in the 1891 setting. Better results were obtained from the improvement. There was very good charging with the first system.

Justice ROMER: Commercially speaking, did you find that the retorts were advantageous?

Witness replied that he did; but he admitted that other retorts were going at the same time, and the gas went into the same holder without

passing through a meter. He made no test to ascertain the illuminating power. They had now entirely abandoned the first retorts.

Re-examined: There had been a very large decrease in wages since inclined retorts were adopted; and the system at Southall was a commercial success.

Mr. *T. B. Ball*, the Gas Engineer of the Rochdale Corporation, said the inclined retort system had been used at Rochdale for seven years. The angle of the retorts was from 30° to 32°. Prior to the patent now sued on, he had never heard of anything of this kind.

Cross-examined: He had only seen the system as described in Coze's specification at Rheims and Kensal Green. These were the only two places where he had seen settings with no levers or baffle-plates to regulate the flow of the coal into the retort.

This closed the plaintiffs' case, and

Mr. Bousfield opened the case for the defendants. He asked, first of all, apart from any question of the form of the claim of M. Coze, or the way he had put it, what was it this gentleman invented? Giving the anticipations and the specification the most favourable construction for the plaintiffs, having regard to what had gone before, they could not say that Coze had given the world more than to point out that, in a system of inclined retorts, by an arrangement of incline, a uniform layer might be obtained. The plaintiffs could not carry it one scrap further than that. So far as any apparatus for doing this was concerned, there was nothing more in the plaintiffs' which would help to success than there was in Newton's specification. At the best, the most Coze could say he had revealed was the idea that they might so arrange the angle as to get a uniform layer of coal automatically. This was the germ of his idea which had been fruitful. The suggestion was he had found out that a particular angle was going to give the result by automatically distributing the material in the required manner over the floor of the retort. The plaintiffs could not say the patentee had done anything more than to put forward this idea. When they came to his arrangement, there was absolutely nothing in it; and he thought he should have no difficulty in satisfying his Lordship that the details of the arrangement, instead of helping to produce the result, would lead away from it. The arrangements were not a bit better than those of other people for feeding retorts for other purposes. If they took Newton's arrangement, and put it at a little less inclined angle, it would be what the plaintiffs proposed. There were all the elements in it. It was quite true that there was nothing said by Newton as to how they were to get the result of distribution. It was essential to have a bigger angle than the angle of repose. The defendants had a bigger angle; and so had the plaintiffs' retorts now in use. In Carey's specification, the patentee said he put his retort at an angle of 32½°; and this was practically the angle of both the plaintiffs' and defendants' retorts. The idea of an inclined retort being an old one, the plaintiffs could not step in and say to the defendants that they should not have their retorts at such and such an angle. The only thing left was to invent some means of carrying into practice his idea of getting a uniform layer of coal in retorts inclined at that angle. Looking at the matter as one of history and of substance, he submitted that this was the only point left for the inventor. The witnesses for the defendants would say that the conditions which were essential to practical success, were that they should have the angle greater than the angle of repose; and that, instead of dropping the coal down from a height, they should deliver it as close as possible to the bed of the retort, so that it had nothing to do but to slide down. These were the conditions which obtained in the defendants' installation. He submitted that defendants were entitled, on the materials before the world, to set to work to find out the best means for feeding such a retort in order to ensure even laying. The patentee chose one way, which was not practically a good one; and the defendants chose another.

Justice Romer said the plaintiffs knew, and patented as details in carrying out the invention, the hopper and the moveable shoot.

Mr. Bousfield replied that if Newton's or Wilson's specifications were taken, all that had to be added was to supply the right inclination. The model which had been put in as an illustration of what the patentee intended to be his patent, had a door to the shoot; but this door was the subject of a patent by Coze himself, in 1889—four years after the original patent was taken out.

Justice Romer remarked that people did most extraordinary things, especially when they were the original patentees. For every slight alteration, they took out an additional patent. They would not dare to do it if they were not the original patentees.

Mr. Bousfield said he only mentioned the fact in connection with his argument that Coze did not mind the velocity at which the coal was shot into the retort. Throughout the specification, the truck had to be tipped up, and the coal was distributed of its own accord. The effect of this would be that when the coal had to fall from the top to the bottom of the shoots, the means suggested for distribution were not efficient.

Justice Romer said the patentee took an angle of about 29°, and contemplated a certain fall; and the defendants took an angle of 32°, and diminished the fall.

Mr. Bousfield replied that the patentee had given certain directions; but it was only by working in the opposite direction that the element of success was obtained. In order to deal efficiently with the extraction of coke, they must have a greater angle than the angle of repose; and about this there was not the slightest contest. When the patentee was not able to claim inclined retorts, and could only claim for apparatus, and when this apparatus did not lead to successful results, it would be a strong action to prevent people taking up the thing where Newton left off.

Justice Romer pointed out that it was not said the patent was a perfect one. It would not want improvements if it was. Was Mr. Bousfield going to produce any evidence that an inclined angle such as had been mentioned was used before?

Mr. Bousfield said a witness named Carpenter would give such evidence.

Justice Romer asked what was the system of retorts now in use. Had not the old system gone?

Mr. Bousfield replied not yet.

Justice Romer: To whom does the chief credit for inclined retorts belong?

Mr. Bousfield admitted that a great deal of credit belonged to Coze. But the defendants said the plaintiffs were not entitled to stop them at the point Newton and Wilson reached. It was a great thing to dispense with manual labour. Up to 1891, there was not much field for such an invention. It was not until the South Metropolitan Gas Company's strike that any Company thought of putting these retorts in. It was a very expensive plant; and unless there had been some very serious cause for it, they would never have got a gas company to take up the inclined retort system.

Justice Romer said there was a saving in labour in supplying the retorts and in the discharge.

Mr. Bousfield agreed; but he submitted that Newton's and Wilson's specifications had these advantages. All the defendants wished to do was to take the matter up where Newton and Wilson left off. Newton did not get the best angle for the uniform layer, and the only invention was to step in there, and get the proper angle. All the plaintiffs could get as their patent was the apparatus for obtaining a proper distribution of the coal.

Justice Romer: Of which the most important part is the angle of the retort.

Mr. Bousfield replied that the plaintiffs did not claim an inclined retort. Taking the angle of the defendants, it was impossible to succeed in getting an even distribution by the means described by the plaintiffs. It was a matter of evidence and experiments; and the defendants had made certain experiments bearing upon it.

Justice Romer: Which means that if you have a considerable drop unchecked coupled with your present angle, then the layer would not be evenly distributed.

Mr. Bousfield said if the plaintiffs put their angle at 32° in the specification, they would fail to get even distribution. He submitted that this had a very important bearing on the case. Every one of the plaintiffs' methods would fail, if the angle was greater than the angle of repose.

Mr. *James Swinburne* was the first witness for defendants. He said he had read the specifications which had been referred to. In his view, the arrangements described in the plaintiffs' specification were not sufficient to carry out the object. The object of inclined retorts was to get an even distribution of coal. There was no idea in the early inclined retorts to have them full, because if a gas engineer wanted to have a retort full he would make it vertical. Before the date of Coze's patent, inclined retorts at the angle of repose were known and tried, but he could not say used. In the early eighties, people began to have their attention drawn to charging retorts by machinery. Coze, in his specification of 1885, compared the sloping retort with the old practice of horizontal retorts charged with scoops; but he did not seem to realize the difficulty of getting a uniform stream of coal. It was quite possible that a highly educated stoker might take the trucks and tip them very gradually; but there was not the slightest suggestion of this in the specification; and if the drawings were examined carefully several of them rather precluded the idea. In fig. 1, if the angle of the retort was greater than the angle of repose, and the coal was dropped down the shoot, it would be unevenly distributed. Even if the drop was regulated by a door in fig. 1, there was a difficulty, as the larger lumps of coal ricocheted down to the bottom of the retort. There was no hint in the specification of dropping the coal into the retort in a slow stream, instead of in bulk. It was a matter of great importance to have the angle greater than the angle of repose, in order that the coke could be got out easily. At Salford the angle was greater than the angle of repose of coke on clay; and it often happened, on the door being opened, the coke fell out without being touched. The essential part in the defendants' apparatus was that all the retort tiers were treated alike. In all cases the coal was made to go in a continuous stream; and the coal was broken up to a state of uniformity. If in the defendants' apparatus, the plaintiffs' arrangement (with bent charging mouths forming prolongations, giving a fall in the charging mouth as described in Coze's specification) was substituted, the effect would be that the coal would go into the retort and lie at the bottom. It would not be a nice even layer; and gas companies would not work them under these conditions.

Justice Romer: Did the patentee tell you what he wanted to get?

Witness said he was quite sure of what the patentee wanted to get; but the defendants secured it, and the plaintiffs did not. Taken through the specifications relied on as anticipations, witness stated generally that Newton, Wilson, and Carey had practically the same arrangements as plaintiffs.

Cross-examined by Mr. Walter: The patentee realized to the full the position in which the coal ought to be placed in an inclined retort, in order to produce the full quantity of gas. The patentee utilized the full weight of coal to give the initial velocity to it, to cause it to slide down the retort; and he described apparatus for this purpose. He did not find in any of the anticipations a combination of a stop at the bottom, an inclined retort, and the charging of the retort by the gravity of the coal. The main essentials of success were an inclined retort, and a uniform stream of coal. There would be no difficulty sending the coal, according to plaintiffs' specification, down the shoot in an avalanche.

Mr. Walter: If you open the defendants' lever suddenly, you fill up the retort.

Witness: No, because there is a stop.

The further hearing of the case was at this point adjourned until to-day (Tuesday).

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Thursday, March 18.

(*Before Justices* Cave *and* Lawrance.)

Williams and Another v. The Mayor and Corporation of Manchester. The Right of a Burgess to Inspect Minutes.

This was a case stated in an action to try the extent of the right given by section 233 of the Municipal Corporations Act, 1882, to a burgess of a borough to inspect the minutes of the Council and its Committees.

Mr. C. A. Russell, Q.C., appeared for the plaintiff; Mr. Asquith, Q.C., and Mr. Macmorran, Q.C., represented the Corporation.

The case submitted to the Court set forth as follows: The plaintiffs are citizens of Manchester; and defendants are a Corporation regulated by the Municipal Corporations Act, 1882. This Act provides as follows by

section 233: "The minutes of proceedings of the Council shall be open to the inspection of a burgess on payment of a fee of 1s.; and a burgess may make a copy thereof, or take an extract therefrom. A burgess may make a copy of, or take an extract from, an order of the Council for the payment of money." Certain Standing Orders for the management of the business of the Council were made by the Manchester Corporation; among them being the following: "No motion or amendment shall be made or proposed, or any discussion allowed, upon the confirmation of the proceedings of the several Committees, with reference to any matter within the province of a Committee which does not appear upon the minutes to be confirmed; but any member may put a question to the Chairman of the Committee with reference to any such matter." "An epitome of the minutes of the several Committees of the Council shall be prepared each month, under the direction of the Town Clerk, and be submitted to the Chairman of each Committee prior to its being sent to the Council." The Council have appointed no less than 21 Committees; and the ordinary business of the Corporation is regulated and managed by them. The minutes kept by the Council merely refer to the proceedings of the Committees by stating that such proceedings have been approved. Minutes of the proceedings of Committees are also recorded in books, which are submitted for the approval of the Council. The acts or proceedings of the Committees which are approved by the Council are not specifically recorded in the minutes of the Council, but are approved by reference to the minutes of the several Committees, and can be ascertained only by inspection of the last-mentioned minutes. The plaintiffs made an application for an inspection of the minutes of the proceedings of the Gas and Rivers Committees, which are referred to in the minutes of the Council as having been read and approved during the past two years; and they tendered the fees mentioned in the section. They were not allowed to see them, but were referred to the Council minutes. The Corporation objected to produce the minute-books so kept by the Gas Committee and the Rivers Committee respectively, on the ground that the production of the minutes of these Committees would be inimical to the interests of the citizens of Manchester. The Corporation, having regard to the foregoing considerations, were of opinion that it was not consistent with the public interests to permit inspection of the minutes of the Committees in all cases; and as they were advised that such inspection could not be claimed as a right under the statute, they declined to permit the inspection claimed by the plaintiffs. On the part of the plaintiffs, it is alleged that when the proceedings of any of the Committees have been approved by the Council, and such approval has been recorded as in the specimen minutes, they are entitled to inspect the minutes of such Committee for the purpose of ascertaining what acts or proceedings of the Committee the Council have approved.

Mr. Russell, on behalf of the plaintiffs, said the minutes, as printed, were simply illusory. They practically gave no information without an investigation of the minutes of the various Committees. The minutes should show what the proceedings of the Council were. Thus, if a sum were recommended for building a band-stand, the fact of such sum being allowed ought to appear, which it did not on the minutes as now settled. There was no record of an order for payment of money. Section 233 was thus rendered nugatory. The acts of the Council should be expressly recorded, or, if they were not, burgesses ought to have leave to refer to the Committee's minutes. Epitomes of Committees' proceedings were provided for members of the Council. This showed the Council minutes were not sufficient to inform members of what their business was.

Mr. Asquith, for the Corporation, said they simply desired to know what their duty was in the matter. The minutes were kept as had been done for sixty years. The minute-books of the Committees contained a vast amount of information which it would not be advisable to make public, and which perhaps, being preliminary, would not form part of the acts of the Council. The plaintiffs were not entitled to see these minutes of Committees. Perhaps if the epitomes were treated as minutes of the Council, this would satisfy both parties.

Justice Cave said, if this were thought to be sufficient, it would settle the matter.

Mr. Russell said that till the present time the epitome had been refused.

Their Lordships then granted a declaration that the burgesses were entitled to inspect in future all acts of Committees submitted to the Council for approval, whether approved or not.

The plaintiffs' costs will be borne by the Corporation.

COUNTY OF LONDON ASSESSMENT SESSIONS.

Sessions House, Clerkenwell, E.C.—Monday, March 15.

(*Before Mr.* W. R. M'Connell, *Chairman, and a Bench of Magistrates.*)

The Assessment of the South Metropolitan Gas-Works.

The hearing of this case was resumed to-day.

Sir E. Clarke, Q.C., M.P., Mr. Balfour Browne, Q.C., and Mr. W. C. Ryde represented the Company. Mr. Littler, Q.C., C.B., Mr. Marshall, Q.C., and Mr. Horace Avory appeared for the Greenwich Union; Mr. Marshall, Q.C., and Mr. Graham, for the parish of Battersea; Mr. Marshall, Q.C., Mr. Sinclair Cox, and Mr. Cutter, for the Woolwich Union; Mr. Lawson Walton, Q.C., and Mr. T. T. Payne, for the Lewisham Union; and Mr. Graham and Mr. Elliott, for the parishes of Clapham and Streatham.

Sir E. Clarke said Mr. Dinwiddy had handed in a table showing the gross profit per ton of coal used for the ten years 1886 to 1895; and these figures, it appeared, were derived from printed accounts of the Company. He (the learned Counsel) did not challenge this result; but he had had the figures for 1896 got out, and he believed Mr. Dinwiddy had checked them. He (the learned Counsel) now applied for permission to add the figures for 1896.

Mr. Marshall objected, on the ground that they could not be legitimate evidence. If gone into at all, the whole balance-sheet for this latter period should also be considered. He admitted that he had used one isolated figure in this period; but if any difficulty was likely to arise about it, he would abandon it.

Eventually, the Court decided to allow the figures to be added to Mr. Dinwiddy's table.

Sir E. Clarke then gave the figures, as follows: In 1895, the receipts for gas sold, per ton, were £1 1s. 7½d., in 1896, £1 1s. 8½d. The cost of coal per ton in 1895 was 10s. 6½d.; in 1896, 10s. 4d. The residuals, which stood at 7s. 9½d. in 1895, only realized 6s. 9¾d. in 1896. Thus there was 1d. per ton added to the receipts for gas; and the cost of the coal was 2½d. per ton cheaper. The fall in the price of residuals, however, brought out the net cost of the coal at 3s. 6¼d. per ton, instead of 2s. 9¼d. The wages for carbonizing per ton were 2s. 9¾d.; so that the total cost per ton was 6s. 4d. in 1896, as against 5s. 6¼d. in 1895. The profit per ton was 15s. 4½d., instead of 16s. 1¼d.—or 8¾d. less.

Mr. Marshall pointed out that the result upon the gross profit in 1895 was £665,007; while in 1896 it was £659,525—a fall of only £5482, which was due to the larger tonnage of 1896. He then proceeded to address the Court on behalf of the parishes he represented. From the commencement of the case, he said it had been represented to the Court, both in terms and in figures, that the conduct of the respondents had been somewhat oppressive, in the large increase on the rateable value settled at the last quinquennial valuation and the assessments now appealed against—particularly in regard to the parish of Battersea, in connection with which it was stated that the difference between the two figures was as much as 149 per cent. The figures of the case would show that there was no ground for this statement, for the reason that the assessment fixed in 1889-90, in consequence of those years being particularly bad ones, was abnormally low. Therefore, a comparison between the two periods was not fair. When the Company recovered their normal prosperity, it was only natural that the respondents should return to the earlier figures, and put the assessment upon that basis. This was what they had done; and they claimed no more. The strike in 1889, and the lowering of the price of gas from 2s. 5d. per 1000 cubic feet in 1888 to 2s. 3d. in 1889, caused the shrinkage of the profits from £309,000 in 1888 to £203,000 in 1889, and to £157,000 in 1890. The figures of the two last years were largely the basis of the assessment, which was therefore extremely low. In 1891, the price of gas was raised by 3d. per 1000 cubic feet—from 2s. 3d. to 2s. 6d.—and immediately the profits rose; the figures being £214,000 in 1891, £313,000 in 1892, £334,000 in 1893, and £356,000 in 1894. It was obviously unreasonable to make any comparison between the assessment based on the very low figures in 1889-90 and that of the years following. Over the four years given, the average was £304,000, as compared with £200,000 and £157,000 in 1890. The effect was that the Company had only paid on the low figure of 1890 up till the present time, though from the average it appeared that the rating should have been at least half as much more. This would have made the comparison very different. Having alluded to the proceedings before the Assessment Committee in regard to Battersea, where the assessment first placed at £7364 was reduced to £5850, he stated, in regard to Greenwich, that the receipts in 1884 were £72,764, in 1889 £78,704, and in 1894-95 £110,448. In 1884, the rateable value was agreed at £12,400; yet now that the receipts were £40,000 more, Mr. Ryde asserted that the assessment should be reduced to £9849. If the percentage method of comparison were taken, it was also apparent that the rate was supported by the figures; for in 1885 it was agreed that the rateable value should be 16·7 per cent. of the receipts, whereas the present rateable value was only 15·8 per cent. on the 1894-95 figures. Then it was asserted that the respondents relied on 1894, and tried to take advantage of its being the most prosperous year the Company had had, to put an excessive and unreasonable rate upon the parishes. It was obvious, however, that they did not desire to take advantage of the prosperity of that year, because the valuations based upon it showed a very large margin which the respondents did not require. This margin, in the year ending June, 1895, was nearly £30,000. Since 1880, the concern had more than doubled in its operations. In the meantime, coal had cheapened considerably; and labour, Mr. Livesey had said, was, owing to the introduction of machinery, much lower in proportion—the item per ton of coal carbonized in 1889 being 4s., and in 1895 only 2s. 9d. Mr. Dinwiddy said the three chief factors in a Company of this kind—the factors that fluctuated—were coal, wages, and residuals. The first two he had already dealt with; and in regard to the latter, he said it was to a large extent the basis of the Company's case. He submitted that, if the Company's valuers had followed the ordinary course in framing their valuations, this rate would have been affirmed, with a margin to spare. Mr. Ryde, the chief valuer to the Company, had really put in no fewer than four valuations. The first brought out the percentage of rateable value to receipts as 8·918; the last, which applied to 1894, produced the figure of 9·289 per cent. When applied to the receipts of 1894-95, the last valuation worked out substantially to about 10 per cent. The parishes which had settled with the Company on the 10 per cent. basis had had to accept Mr. Ryde's figures *en bloc;* but Counsel would endeavour to show that these figures required considerable alteration, and that the percentage should be much higher than 9 or 10. If Mr. Ryde had taken the figures for receipts for the Company's chosen account year, and had followed the usual and proper method with regard to the deductions for statutables, without anything else, and taking the tenant's capital at his (Mr. Ryde's) figure, that would have been sufficient to affirm the present rate. Mr. Ryde suggested that, outside the figures for the actual account year, there should be allowed for further reductions in the price of residuals £26,178 for coke, £804 for breeze, £11,404 for ammoniacal liquor, and £7339 for sulphate—a total of £45,725. On the other side, he said there should be added, for the cheapening of coal, 6d. per ton carbonized, or £19,646—making a net deduction of, roundly, £26,000. But the actual price of coal in the last half of 1894 was 10s. 9d. per ton; and for the following half year, 10s. 11¼d.—or an average of 10s. 10⅛d. per ton. In the last half of 1895, it was only 10s. 2d., or a drop of 8⅛d., in place of the 6d. Mr. Ryde had taken. Applying this 8⅛d., instead of the 6d., to the coal carbonized, made £27,665; and deducting this sum as Mr. Ryde deducted the £19,646, gave £18,060 as the most that could be deducted for residuals and coal, supposing that the figure for residuals was correct. But did the actual figures of Mr. Ryde as to residuals, which he derived from Mr. Livesey, bear out the estimate of fall? Counsel went through the figures, showing that in place of the estimated reduction of £26,000 for coke, it was only £10,813; for breeze, in place of £804, it was only £166; for ammoniacal liquor, instead of £11,404, it was only £1176; and for sulphate, in place of £7339, it was only £4396—a total of £16,551 only, instead of £45,725. On the other side of the account, the cheapening of coal in the same period had resulted in a saving of

£15,667, which, within £900, balanced the £16,551 of loss on residuals. In this calculation, he pointed out that he had ignored the large increase that was also taking place in the price of gas, which, of course, would produce more profit. He contended he had shown that the Company had suffered no loss; and that no tenant entering on possession of the undertaking, and considering both these elements of increase and decrease, would on their account have given a penny less as rent. He had not mentioned tar, because Mr. Ryde had made no deduction in respect of it. As a matter of fact, it had improved in value about £1000, for which he (the learned Counsel) had taken no credit. In regard to the item of ammonia, Mr. Ryde took the figure for the last half of 1894 at £23,030; and then for the next half year—the fall in price occurring at the end of 1894 and beginning of 1895—he allowed a reduction, and thus made the second figure £14,983, or a total of £38,013. Then, however, from the £38,013 he made a further deduction for the fall of 30 per cent., so that he had deducted twice from the second half year in respect of the fall. Against himself, Counsel pointed out that there was between the first and second half of 1895 a reduction in ammonia of only some £1100. He went on to quote Mr. Valon's figures relating to the fall in coke. The receipts for coke for the year ending December, 1894, and June, 1895, were practically the same—viz., £218,964 and £218,147 respectively—while for the complete year 1895, the figure was £210,145—a diminution, as against the other two figures, of about £8000, which had to be set against Mr. Ryde's figure of £26,000. Then in regard to tar, Mr. Valon brought out an increase in the complete year 1895, as compared with 1894, of nearly £7000, which would substantially balance the decrease in coke; and in the first half of 1896, tar was still going up. Sulphate, no doubt, was going down; but Mr. Valon showed that, taking the gas meter and stove rental, coupled with the variations in residuals, but irrespective of the fall in the price of coal, instead of their being a loss on 1895 as compared with 1894, there was an increase of £44,939. The net revenue for the last half of 1894 was £169,573; and for the first half of 1895, £167,407—a loss of only £2000, which represented all these contemplated losses. Mr. Livesey had said that taking 1d. off the price of gas had caused a loss of £30,000, and that it would require £105,000 of receipts to recoup this sum. But it could not be so, because by June, 1896, despite a reduction of 1d. in the autumn of 1895, there had been an increase of some £44,800 in the receipts, and the reduction had been recouped. The result of these calculations, Counsel submitted, was incontestably to show that, as regarded the residuals and coal, the Company were entitled to no deduction. Further, he also held that they were not entitled to a deduction in respect of the decrease of 1d. in the price of gas. The hypothetical tenant, going in at the end of the second half year, would know nothing of the reduction, because the resolution authorizing it had not then been passed; and he would therefore make no allowance for it. It was purely optional on the part of the Company to reduce the price; and it was equally within their power to raise it, and by more than 1d. if they liked—as they did in 1891. Moreover, that they contemplated this course was evident from a speech of the Chairman in February, 1896. Counsel apprehended that, in view of these facts, the Court would not let the reduction influence the rateable value of the concern for the next five years. The question really was: Was the landlord's rent to be dependent on a matter entirely within the control of the Company, who were in the position of the tenant? It certainly seemed unreasonable that it should. The learned Counsel went on to quote two decisions, in which he claimed it was held that the Court would make no deductions from the gross receipts because of a lowering of the price of gas. Turning to the item in Mr. Ryde's valuation, of £13,028 for repairing and renewing gas-stoves, he said this amount seemed to be very excessive, and to indicate the existence of rather an old stock, upon which most of the money was expended for repairs. The meter-rents were £21,886; yet the meter repairs and renewals totalled to £15,313. In 1894, the repairs actually exceeded the rents. Mr. Livesey gave 2 per cent. per annum as the number condemned. If that were so, the repairs must be unduly large. Surely, therefore, the meters and stoves, apart from those purchased in the last year or two, must be somewhat ancient. As to the £8591 appearing in Mr. Ryde's valuation, for labour in fixing automatic gas meters and stoves, and allowed as an item of expenditure in the one year, Mr. Dinwiddy and Mr. Eve held that it was expenditure by way of capital, and ought not to be attributed to current revenue. Mr. Marshall really admitted this in cross-examination. The two former said practically it should not remain as a charge against revenue; but that if it was to be so charged, it ought not to be charged in one year. The learned Counsel thought this was a perfectly sound position. The item was also charged against tenant's capital; but to do this, and to leave it to the revenue, was charging it twice over, which was certainly wrong. With regard to statutable deductions—repairs to mains, works, and service-pipes, to be divided between landlord and tenant—Mr. Ryde took the total of £172,430; being the expenditure under this head in the Company's account year. Then he allowed the tenant one-third of the sum—roughly £57,000—as a fair proportion, instead of taking the average over several years. This, however, was absolutely wrong, because the Act said the allowance was to be the probable annual average cost of maintenance. When questioned, Mr. Ryde said he considered the account year an average year; thus adopting the principle of the Act. Counsel quoted figures put in by Mr. Eve, showing that the expenditure on this head per ton in the year taken was largely in excess of the average of the preceding years and he contended, therefore, that the figures of that year should not be applied. The question then arose as to whether the parishes had taken the proper figures to represent the probable average annual cost. To be fair, they had taken the expenditure per ton of coal carbonized over a number of years, and then applied it to the coal carbonized in the year in question—this being the only way he (Mr. Marshall) held that they could conform to the statute. The result was that, instead of the £141,769 which Mr. Ryde said should be taken for repairs of works and plant, Mr. Dinwiddy brought out a figure on these averages of £120,167. The difference in regard to mains was so little that Counsel ignored it. As to the proportion of this figure allowed to the tenant, Counsel thought there was some little force in Sir Edward Clarke's contention that, as Mr. Dinwiddy had taken roughly one-third in his 1894 valuation, he ought, to be consistent, to have also taken one-third in his valuation for the year to June, 1895. The figure, however, was merely an estimate; and as Mr. Eve had allowed only £30,000, Mr. Valon £28,000, and Mr. Hedley £19,000, it seemed that from £20,000 to £25,000 would be more correct than the £35,000 of Mr. Dinwiddy. In regard to the item of £70,426 in Mr. Ryde's valuation for stores, including tools, materials, meters, and gas-stoves, Counsel said they knew that the meters and stoves accounted for £12,360 of this sum. Therefore the stoves were valued at some £58,000. It was mainly in respect of this item that the £57,000 already alluded to was spent, which was rather a striking fact—viz., that as much should be spent on the stoves each year as they were valued at. Mr. Woodall went into a long statement of other services under this head; but Counsel, after examining it, said it must be evident that Mr. Woodall had prepared it a little loosely, and that he had not looked into the books to verify what he was speaking to. Turning to tenant's capital, the first question was whether the Company's valuers were entitled to claim, as they had done, five months' expenditure as allowance for tenant's capital. He submitted that, on the facts elicited from Mr. Livesey and Mr. Ryde, unless some method such as that adopted by Mr. Marshall was taken, they were not entitled to anything like five months' allowance. To test it, a tenancy was supposed to commence, as fair to both sides, at the beginning of January. Then the question was how soon would money come into the concern to relieve the ingoing tenant of having to provide for working expenses and stores. It turned out that during January, February, and March gas-rentals were coming in; and Mr. Livesey said the collectors started at the latter end of April, and collected about 65 per cent. of the total by the end of May—about 5 per cent. being received as early as April. Without going further, this showed that some money was received before the end of the fourth month. Then consumers' deposits, standing at £25,000, were taken over, of which Mr. Ryde had only allowed a portion, but which he (the learned Counsel) thought should be allowed in full. There were also the workmen's deposits; £1000 a week from the beginning from the automatic machines; and sums received from persons moving, who generally paid up at the time of removal. These items totalled over £50,000, which would be continually coming to the relief of the new tenant. Mr. Marshall (the witness) put it that, if he went in at the beginning of October, he would have to provide for the four heaviest months, when the consumption of coal was equal to five ordinary months; and therefore that he ought to be allowed the expenses of providing for the heaviest part of the year—to take 5 average months, instead of 4 or 4½ as suggested. This, however, only applied to coal, and not to the other expensive items—to £194,000 out of over £500,000. Counsel went on to refer in detail to Mr. Hedley's table, showing the position of the hypothetical tenant at various periods of the year, starting on July 1 with £159,400. According to this table, his balance would never be less than £69,000—that was, assuming that he started with four months' working expenses. Counsel thought that, for all practical purposes, the table was accurate; and, if studied, it would demonstrate that four months' working expenses was not only ample, but left a large working margin. Mr. Marshall (the witness) took 4½ months in The Gaslight and Coke Company's case; stating as his reason that some credit was given for the payment for coal. But in the present case a little credit was also allowed. The Company's valuers had claimed that, while on the one hand they required five months' expenses for coal, they only got four months' expenses for residuals, because of the credit they had to give. It appeared from the balance-sheet, however, that the two were about similar; and it also seemed, from the evidence and contracts, that some credit was obtained for coals, while some portion of the residuals was sold for cash. Mr. Ryde, in addition to the month's allowance—whatever it was—said there should be six weeks' coal supply to provide for emergencies. This supply, with the other allowance, worked out to about 35 weeks' supply. Surely, however, Counsel contended he ought to take six average weeks, instead of the six fattest. Six weeks' supply, as he took it, was worth about £49,000, while, as a matter of fact, the Company never had had in store more than £39,000 worth. If this amount was allowed, therefore, they would be giving the Company £10,000 worth more than they had ever had. Counsel, in reference to the profit-sharing, reviewed the different lights in which it was regarded; and asserted that if it went into current expenditure, it ought not to go into the tenant's capital. Moreover, as it was not payable until the end of the year, the incoming tenant would not require money on this score during the time he was relying on his own resources. Therefore, he held that the reason for putting it in tenant's capital failed. With regard to meters, stoves, and fittings, he produced a table, prepared from the evidence, giving in separate columns the figures in this connection of Mr. Ryde, Mr. Marshall, and the respondents. The first item was wet meters £93,312, which was according to Mr. Ryde. The next—taps for stoves and meters—Counsel submitted certainly ought not to be allowed. They were taps between the meters and service-pipes, and formed part really of the service-pipes. The question was as between the landlord and the Company; and he was strongly opposed to the claim. The item altogether amounted to £16,000, so that it was rather important. The item for fitting and fixing meters, respondents also strongly contended should not be allowed. Mr. Ryde made a claim in this respect; and Mr. Marshall, who allowed for it in working expenses, admitted that it ought not to be claimed again in tenant's capital. The valuation by the Company of their automatic stoves was £27,062. Then came the claim for fixing; but to this also the respondents very strongly objected. As to the important item of automatic gas-fittings £51,732, the statement of Mr. Livesey would be fresh in the mind of the Court. An extra 9d. per 1000 cubic feet was charged to automatic gas consumers; and after defraying the extra cost in connection with fittings, &c., the balance of the 9d. was carried to a suspense account which did not appear in the Company's receipts at all. Mr. Livesey said the sum was about £10,000 a year; and for this there was no credit at all. The Company claimed 17½ per cent. upon this £51,732, which would come to about £8700. They, however, gave no credit for the £10,000 on the other side of the account. One ought to be set against the other; and if this were done, they would be cancelled. Therefore he contended that the figure of £51,832 ought to be discarded. With regard to the depreciation of meters and stoves, the respondents' valuers took it all round at 32 per cent. It was an estimate which could only be made from experience; and the Bench would have to decide on the point. Mr. Marshall took the average at 6¼ per cent. per annum for new meters; and this, in five years, would amount to about 30 per cent., which was near respondents'

figures, though the meters generally must be much more than five years old. The interest which the Court had decided to allow on tenant's capital was 17½ per cent., which percentage, however, would only apply to those items to which it was properly applicable. A broad distinction had been drawn in decided cases between stores, which had been thought to be entitled to a lower rate of interest, and the other part of the tenant's capital. In two cases which he quoted, 10 per cent. only was allowed on stores. With regard to residuals, he said some of the valuers had included the stock of residuals as an addition to the stock of coal, as a thing which the tenant had to provide, and which he should be allowed the percentage on. Mr. Ryde had not done so; and there was good reason for this course being adopted, because really the residuals were a saving—a relief against the expenditure on coal, not a thing to be directly provided for. Therefore the 17½ per cent. should not be allowed on it. In reference to the floating cash, Counsel went through the opinions of the various witnesses; and he suggested that, if Mr. Hedley's table was accepted, nothing beyond the £159,000 with which the tenant would start was required. He went on to refer to the valuation of Mr. Marshall, who approached the subject, not on the basis of profit earned, but of what profit the Company could distribute as interest on shares and debentures. But whatever profit was made, would certainly leak into the pockets of the shareholders, though it might be distributed over a number of years. One table handed in by Mr. Livesey showed that in eight years more had been paid away than had actually been earned. In other words, they had distributed all the profits of the period, *plus* some of the reserve fund. If Mr. Marshall's valuation were adopted, it would certainly happen that in a year that was favourable to the Company they would call him, and in an unfavourable year they would not; and the parishes would have no remedy. In the account year to June, 1895, according to Mr. Marshall's schedule, the Company got the benefit of no less than £29,000; the profit made that year being £345,000, of which he only took £317,000. Mr. Marshall made a claim of £14,000 for annual depreciation of new meters; but Counsel submitted that there was absolutely no ground for it. It had already been claimed in another form, because the renewals, as well as the repairs, were paid out of the current expenses of the year; and renewals being included in the fund, obviously they could not also have an allowance for annual depreciation. In conclusion, he drew attention to the fact that, whereas the average cost of maintenance and renewals came out at between 3s. and 4s. per ton of coal carbonized—Mr. Eve taking 3s. 11d.—Mr. Marshall had adopted the figure for 1894-5 (the highest of recent years), and even then added a small sum, making the figure 4s. 6d. per ton, which he submitted was at least 7d. in excess of what it should be.

Mr. GRAHAM, on behalf of the parishes of Wandsworth and Streatham, said Mr. Marshall having so fully covered the ground, he should speak briefly. Gas and water companies were in a very peculiar and exceptional position; having a practical monopoly in the districts they served, even stricter than in the case of railways and undertakings of that description. Practically, every person burning gas had to accept it from the company supplying his district.

The CHAIRMAN: There is the rivalry of the electric light.

Mr. GRAHAM: Yes; that may come in. But electric lighting has not frightened gas companies; and you do not find gas shares going down in consequence. He proceeded to refer to Mr. Hedley's table from 1880 to 1895, showing, except in 1890 (the strike year), progressive increases in the business. Though there might be an exceptional year, like 1890, yet they had been able to accumulate large reserves, and even in the year of the strike to maintain the uniform dividend they had been paying. He contended that, if this property were put on the market, there would be no difficulty in finding a company who would purchase at very much more than the rateable value put upon it. The profit for the year ending June, 1895, was £346,575; and the agreed rateable value of the works—£269,579—which was the rent that the tenant was expected to pay to his landlord after deducting from the earnings all that was required for everything necessary to keep the hereditament in a condition to earn the rent. After paying that rent, he would have £76,996 to put in his pocket. There was no doubt—having regard to the price of the stocks of these undertakings at the present day—that there would be no difficulty in getting a tenant to pay this rent if he could make £76,000. Mr. Livesey had dealt unfairly with the Unions he (the speaker) represented, because he estimated that the receipts, in consequence of the fall in residuals and the reduction of 1d. in the price of gas, would fall by no less than £119,000, though at that time he had the actual figures showing an increase of over £40,000. The profits did not increase—in fact, they decreased as against the year 1894; but then 1894 was an abnormally good year. As compared with 1893, there was an increase in the profits of £10,000. Anyone knowing the district of the Company, must see that this would be so. Perhaps the example of Battersea would be the most striking. In 1889, the gross receipts there were £25,586; and in 1895, £37,338—an increase in six years of 50 per cent. In the same period, the profits of the whole undertaking had increased by 100 per cent. On the meters, stoves, and rentals, £306,177, Mr. Hedley had made the liberal allowance of 17½ per cent.; and on the cash balance and stock, £159,400, 10 per cent. In conclusion, Counsel asserted that, whether putting in as tenant's capital £730,000 according to Mr. Marshall, or £465,000 according to Mr. Hedley, the tenant would be perfectly satisfied with the security. On the figures before the Court, he submitted that the rateable value put by the respondents on the undertaking ought to be sustained.

Mr. TYRRELL PAYNE, representing Lewisham, said he also should be brief. He turned first to the decreases claimed by the appellants in respect of the reduction in the price of gas and of the fall in residuals. Both items involved travelling outside the account year—a course which he submitted was most unsafe. The Court had to decide upon the figures for the year to June, 1895, having regard to any progressive increase or decrease which the hypothetical tenant for 1896 would have to pay. The appellants had dealt with the reduction in the price of gas and the assumed decrease in receipts from residuals; but they had not been able to say how these sums would be affected by the quantity of gas sold on the one hand, and the increase there would be in the sale of residuals on the other. Therefore, he submitted that both Mr. Ryde and Mr. Livesey had gone wofully wrong. Mr. Livesey, when before the Assessment Committee, showed figures for the whole of the year 1895, upon which he estimated that there would be a loss for the year on the total receipts, including residuals, of no less than £134,000; whereas the actual figures showed an increase of £44,000 over the year 1894. No one was more competent than Mr. Livesey to make a proper estimate of what was likely to happen. Yet he made this big mistake; and the Court were now being asked to make a similar one. The same applied to the loss on residuals, which was put at £45,725, but actually amounted to £24,000. He submitted, therefore, that the only safe course for the Court was to follow the figures for 1894-95. Then the Company were asking the Court to adopt their method of finding out the decreases in residuals—viz., that of taking an allowance per ton; but unless they knew the number of tons sold, this gave no clue as to what the decrease was. With regard to the automatic supply receipts, Mr. Ryde and Mr. Woodall, in first giving evidence, assumed that the whole of the 9d., which was part of the 3s. 1d. per 1000 cubic feet charged to the automatic gas consumers, was brought into the account. If they had not assumed that the whole had gone into the account, they would not have allowed the £8000 for gas-fittings and labour. As to automatic gas-fittings, there was a charge of £41,000—being £51,000, less 20 per cent. for depreciation. He submitted, first, that they should not be charged at all; but that, if they were charged, then the 20 per cent. ought to be much higher. These were fittings put in houses, and were not worth removing at any time. Yet it was said the incoming tenant would have to buy them. He contended that this was not so; and in any event, they could not expect the tenant to give nearly as much as four-fifths of their prime cost for them. As to workmen's deposits, the principle was agreed; but in regard to consumers' deposits, the Company's valuers only allowed a part, on the ground that the item fluctuated. It was perfectly clear, however, that £25,000 had always been in the hands of the Company, for the last five years at least; and he submitted that there was no real distinction to be drawn between this £25,000 and the £30,000 which the Company kept in hand on the score of workmen's deposits. It was admitted that they had £41,000 on this head, of which they had invested £11,000; and in so far as the balance of £30,000 was left in the hands of the Company, it was not denied that it should go in aid of tenant's capital. Further, Mr. Livesey was not asked a single question to show that the Company did not use this £30,000. In conclusion, Counsel briefly brought to the notice of the Court the figures of Mr. Dinwiddy, with regard to the two percentages of 10 and 17½ allowed on different portions of the tenant's capital, and explained how he had altered them in accordance with the decision of the Court to allow the 17½ per cent.

Friday, March 19.

On the Chairman taking his seat,

Sir EDWARD CLARKE called attention to the fact that there was only one other Magistrate present. It was a technical matter; but there was a provision in one of the Acts of Parliament, he believed, that the quorum should not fall below three.

Counsel for the respondents, however, did not object to the formality, if it applied, being waived; and the Chairman concurred.

Sir EDWARD CLARKE then addressed the Court on the whole case, on behalf of the appellants—our report of his speech being unavoidably held over till next week. At its close,

The CHAIRMAN intimated that he was unable at present to fix a day for delivering judgment; but the Court would enter on consideration of the case as early as possible.

With the exception of the above case, the Court has now dealt with all the rating appeals in which gas or water companies were concerned. The Chelsea Water Company's assessment in respect of St. Mary Abbotts, Kensington, has been reduced, by consent, from £7051 to £6700 gross, and from £5825 to £5525 net; and that of the West Middlesex Company in respect of the same parish, from £23,013 to £22,000 gross, and from £18,606 to £18,000 net.

BRENTFORD COUNTY COURT.—Friday, March 5.

(*Before His Honour Judge* BAGSHAWE, Q.C.)

Grand Junction Water-Works Company v. Cowley—The Charge for Water for Gardens.

This was an action brought by the above-named Company against Mr. A. V. Cowley, of 83, Castle Bar Road, Ealing, the Secretary of the Ealing Water Consumers' Protection Committee, to recover £1 1s. for water supplied for garden purposes. Defendant paid 5s. into Court.

Mr. RAM appeared for the plaintiffs; Mr. R. W. TURNER represented the defendant.

His HONOUR remarked, at the opening of the case, that the payment of the 5s. was in itself an admission of liability.

Mr. TURNER said he thought he could not avoid that. The Company had a right to charge something, but not so much as they had done.

Mr. RAM contended that, under the 48th section of the Metropolis Water Act, 1852, the Company had a right to exclude water used in a garden from that supplied for domestic purposes. The Company in 1894 gave notice that they would charge £1 1s. per season, unless the consumer required the service to be by meter, when a minimum supply would be charged for on a certain scale. At this rate, the defendant would have been charged more for the half year representing the summer; the amount working out at 15s. 9d. per quarter. The defendant refused to comply with the terms of the circular, and used the domestic supply for his garden. It had been held in the action brought by the Company against Mr. Neale, that if a man so acted he committed a tort, for which he must pay at the rate laid down by the Company—namely, £1 1s. The Company wrote to the defendant, telling him that if he continued using a hose he would have to pay £1 1s. per season; but if he discontinued the hose, the charge would be reduced to 10s. 6d.

Mr. TURNER said he was prepared to admit the notice being sent; but he disputed the right of the Company to make an even charge of £1 1s. upon all gardens, regardless of size. His client's garden contained only 785 superficial feet; and it was unfair to charge him the same as was charged for gardens in Ealing four times its size. The defendant very properly refused to pay the guinea, but proceeded to use in his little garden the water laid on to his house.

His Honour: You had no business to help yourself to other people's property, declining to pay the price you know they put on what they have for sale.

Mr. Turner: The point is whether we committed a sort of trespass in taking this water. Then comes the question: What damages have the Company suffered by our using the water?

His Honour: Loss of water.

Mr. Turner: In the case of Neale, the garden was much bigger than ours; and the judgment referred to its size and other circumstances in settling the £1 1s. as being a fair charge for the water used on it. Our case is different, as our garden is so small.

His Honour: It is impossible to arrive at the absolutely correct amount of the water used. If a gardener is to be subjected to inquiry how big his garden is, and the size of his flower-beds, the problem will be insoluble.

Mr. Turner: The Company should, in fairness, make a varying charge. They could size up the gardens in the suburbs. I take it that, under existing arrangement, it makes poor people pay for the richer.

His Honour: That is probably because the Legislature has, somewhat unreasonably, left it to the Company to say what they will charge. Any new Act might make it that the price should be charged upon the rateable value of the garden.

Mr. Turner said if they had the water by meter, it was left to the Company, not otherwise. He proceeded to argue that there could be no agreement. The Company were the holders of a monopoly; and they coerced consumers into the position of paying what they charged. A consumer never got into the position of being able to say a word on his own behalf. I quite agree there would be a difficulty in determining the amount of water used; but my case is that the size of the gardens should be considered.

His Honour said he could not deal with the question of a few shillings. It seemed to him that there was an implied contract. He thought it would be impossible to make any accurate scale; and, considering the admission that the notice from the Company was received, he saw no reason to come to a conclusion that the charge made was unreasonable or prohibitive.

In view of the case going to a higher Court, each party agreed to call evidence in support of the arguments; and the hearing was adjourned until the 13th inst., in London. At the same time, his Honour strongly intimated that it would be wise for the defendant to come to terms with the plaintiffs.

Saturday, March 13.

The proceedings were resumed to-day at his Honour's chambers in the Middle Temple; but no witnesses were called—the case being simply further argued.

His Honour, in giving judgment, said he found the offer to supply water to gardens by means of a hose for the sum of £1 1s. was reasonable, and the use of the water was an implied acceptance of the terms imposed by the Company. In fixing the charge, they were bound to take into account not merely the minimum amount of water used, or even that used by any reasonably-minded person, but also that taken by the numerous body of consumers who construed their rights with the utmost liberality towards themselves. Considering all this, he held the charge of £1 1s. to be fair.

Judgment was then given for the Company for the amount claimed, with costs upon the highest scale; but, in view of the importance and general public interest of the case, leave was granted to appeal.

The Incandescent Gas-Light Company's Patents.

Last Saturday, Mr. Justice Romer had before him, in the Chancery Division of the High Court of Justice, a motion on behalf of the Incandescent Gas-Light Company, Limited, to commit one Marsden, who carries on business in Fore Street, City, for breach of his undertaking, given on Dec. 18, 1896, not to manufacture or deal in any mantles for incandescent gas lighting constructed in infringement of the Company's patents of 1885 and 1886. The case was not reached until one o'clock, and then there was not time to dispose of it. After considerable discussion as to the regularity of the proceedings—defendant's Counsel asserting that an entirely new case was now raised to that made when the notice of motion was originally served—his Lordship said he would put the case in the witness-list to come on and be disposed of on *vivâ voce* evidence on the 30th inst.

Wilful Water Wasters Punished.

At the Thames Police Court, last Saturday, Peter and Betsy Ringen, of 177, Jubilee Street, Mile End, were summoned for not paying fines ordered by the Court. The male defendant did not appear. On the 20th of August last, as reported in the "Journal" at the time, defendants were convicted and heavily fined for wasting the East London Company's water; Mr. George Kebbell pointing out that the case was probably the worst of its kind ever brought into Court. Defendants had continually and wilfully wasted about 2000 gallons of water a day during the whole of the drought of 1896. Mr. Cluer, who specially attended the Court to hear the case, said as the order had not been complied with, distress warrants would have to issue. Ample opportunity had been given the defendants to pay the money; and when the case was last heard, Mr. Kebbell told him he was very soft-hearted in granting time. Mr. Deakin, who appeared for the defendants, said Ringen had met with a series of misfortunes, and he had to pay upwards of £18 in connection with a County Court matter, besides having had a judgment summons. Mr. Cluer said that, as a large sum was due from both defendants, and as Mr. Deakin stated distress warrants would not be of any use, there would be an order for the money to be paid, or, in default, Ringen would be imprisoned for a month and his wife for three weeks; but the sentence would be suspended for a fortnight.

Ladies as Gas Directors.—The Kelvedon Gas Company, at their recent annual meeting, elected Miss Constance Docwra and Miss Charlotte Docwra on the Board of Directors.

MISCELLANEOUS NEWS.

THE STIRLING GAS-WORKS ARBITRATION.

Edinburgh—Saturday, March 6.

(*Before Sheriff* Lees.)

The proceedings were opened, in the Windsor Hotel, Edinburgh, in a mutual reference by the Stirling Gaslight Company and the Police Commissioners of Stirling to Sheriff Lees, to fix the price at which, subject to the sanction of Parliament, the Commissioners should acquire the undertaking of the Company. The Corporation, on the advice of Mr. James M'Gilchrist, of Dumbarton, offered £61,130 as the price of the undertaking; and the Company, on the advice of Mr. A. Gillespie, of Glasgow, submitted that £68,320 was the price which should be paid to them. The reference was made to the Sheriff of the County to determine which of these amounts, or any sum between them, should be the price of the Company's undertaking. The Corporation of Stirling are at present promoting a Bill in Parliament to empower them to take over the Gas Company's undertaking; and the price, fixed by the Sheriff, will be embodied in the Bill.

Mr. D. Chrystal represented the Gas Company; and Mr. Clyde appeared for the Corporation.

The parties agreed that the number of witnesses on each side should be limited to three; and the Company's case was taken first.

Mr. *J. A. Robertson*, C.A., of Edinburgh, said he had examined the books of the Company in connection with the reference. The sum claimed by the Company was £68,320; and the amount offered by the Corporation was £61,130. He had prepared re-constructed statements, which he put in. He thought it unnecessary, in a matter of this kind, involving only £7000, to put in more than was actually necessary. The Company did not furnish balance-sheets or profit and loss accounts. They submitted their accounts from year to year in a method in which they incorporated the profit and loss account and dividend account in one statement, which brought out the sum available for dividend. The accounts closed on May 15. His statements dealt with the accounts from May 15, 1889, to May 15, 1896. For the year ending May 15, 1890, the sum available for dividend was £3801 3s. 7d.; 1891, £1417 12s. 9d.; 1892, £1724 16s. 2d.; 1893, £3235 18s. 5d.; 1894, £3178 5s. 5d.; 1895, £2055 10s. 4d.; and 1896, £2531 0s. 2d. For the seven years, the total was £17,943 16s. 10d.; and the average was £2563 8s. 1d. The accounts were not made out according to the Gas-Works Clauses Acts. In the schedules, interest was put in what was called the net revenue account. He took out whatever should not be in the working account. The last line in his first statement showed the proper profit on revenue account for each of the seven years. His second statement showed everything he had taken out of the accounts on both sides, for the purpose of correcting the accounts and getting at a proper revenue account. For the year ending May 15, 1890, he had taken out the interest on the sinking fund, £52 10s., and interest on cash account, £2 9s.—those not being working receipts. From the payments he had deducted: Income-tax paid on profits, £77 4s. 6d.; the price of a new exhauster, £151 12s. 11d.; wages expended in connection with the erection of the exhauster estimated at £20; and for new meters purchased during that year, he deducted £49 9s. 9d.—altogether, £298 7s. 2d. The net result of his correction of the year's accounts was that he had added to the balance of profit and loss account £243 8s. 2d. For the year ending May 15, 1891, his deductions were: From receipts—interest on sinking fund £85 0s. 2d.; and interest on bank account £5 17s. 11d., together £90 18s. 1d.; and from payments—income-tax £91 10s. 3d., new cast-iron tank £49, part of the cost of a new gas tank and holder £1542 8s., wages applicable to the erection of new plant and machinery £35, and new meters £49 9s. 10d., together £1774 8s. 1d. He had, therefore, added during the year to revenue £1683 10s. For the year ending May 15, 1892, his deductions were: From the receipts—interest on sinking fund £43 4s. 3d., and cash from sinking fund £500, together £543 4s. 3d.; and from the payments—income-tax £77 17s. 3d., interest on bank account £51 12s. 3d., balance of the price of the new tank and holder £872 10s., three purifiers and carriage £254 10s., battery condenser £84 7s. 2d , wages applicable to the erection of new plant £50, and new meters £56 8s. 2d., together £1447 4s. 10d. He had, therefore, added to revenue account for the year £904 0s. 7d. For the year ending May 15, 1893, his deductions were: From the receipts—interest on sinking fund £23 12s. 6d.; and from the payments—income-tax £56 10s. 10d., interest on bank account £48 1s. 6d., cost of new purifying sheds £115 6s. 6d., iron columns for purifying sheds £42 16s. 8d., wages applicable to new plant and machinery £100, and new meters £44 13s. 1d., together £407 8s. 7d. He had, therefore, added to revenue account during the year £383 16s. 1d. For the year ending May 15, 1894, his deductions were: From receipts—interest on sinking fund £26 2s. 3d.; and from payments—income-tax £97 7s. 9d., interest on bank account £17 9s. 6d., and new meters £33 10s. 10d., together £148 8s. 1d. He had, therefore, added to revenue account during the year £122 5s. 10d. For the year ending May 15, 1895, his deductions were: From the receipts—interest on sinking fund, £14 3s. 11d.; and from the payments—income-tax £109 18s. 2d., interest on bank account, £18 10s. 1d., honorarium to Treasurer £75, new works for oil-process £344 19s. 6d., cost of feu charter (which had nothing whatever to do with the year, but was a capital charge) £30 13s. 8d., cost of revising feu charter £9 1s. 6d., wages applicable to new plant £100, and new meters £52 4s., together £740 6s. 11d. He had, therefore, added to revenue account for the year £726 3s. For the year ending May 15, 1896, his deductions were: From the receipts—interest on sinking fund £40 14s. 2d.; and from the payments—income-tax £86 2s., interest on bank account £34 7s. 1d., new vertical steam-boiler £15, new gas-mains to Torbrex £144 10s. 2d., wages applicable to new plant £160, and new meters £61 1s. 4d., together £501 0s. 7d. He had, therefore, added to revenue account for the year £460 6s. 5d. In regard to the sums for wages, he obtained his information from the officials of the Company, and from the Engineers at his side; and he believed that he underestimated rather than overestimated these sums of wages. He had taken care not to put in anything about which he considered there might

fairly be differences of opinion. In May, 1896, it was found necessary to replace six cast-iron retorts, at a cost of £59 8s. 3d. This might fairly be put in as a capital charge; but he had not done so. The general rule, recognized throughout the kingdom, was that the price to be paid for a gas undertaking was so many years' purchase of the maintainable profit. It was usual to raise the amount expended on repairs, renewals, and maintenance to a sum equal to from 4d. to 5d. per 1000 cubic feet of gas sold. In the case of Stirling, they did not, as in other places, employ outside contractors to execute repairs and renewals. The work was done by their own employees. He had been told that the Company employed three men who did nothing else but attend to repairs and renewals. He found that the wages of these three men varied from £174 to £184 per annum. Wages to other men specially employed amounted to between £80 and £90 per annum. These figures satisfied him that there was included under wages nearly £300 which was applicable to repairs, renewals, and maintenance of works, mains, and services. He calculated that if he took 1½d. per 1000 cubic feet of gas sold throughout the seven years, he would state rather under than over the amount of wages he had to carry to the repairs and maintenance account. For the different years, he had so carried as follows: 1890, £253 12s. 6d.; 1891, £263 18s.; 1892, £277 16s.; 1893, £274 16s. 2d.; 1894, £275 0s. 5d.; 1895, £285 3s.; and 1896, £291 1s. 2d. These made a total of £1917 6s. 11d., or an average of £273 18s. 2d. He separated these amounts from the wages proper applicable to the making of gas. After deducting these sums, and adding them to repairs, he obtained amounts expended on repairs and maintenance as follows: For the year ending May 15, 1890, £496 13s. 4d.; 1891, £591 9s. 3d.; 1892, £723 7s. 4d.; 1893, £738 14s. 5d.; 1894, £665 10s. 6d.; 1895, £623 4s. 1d.; and 1896, £647 1s. 1d.—together, £4490 4s. 7d., or an average of £641 9s. 3d. per annum. The oil process was introduced into Stirling in 1893-94, though the results of its working were not realized till 1894-95. The introduction of this process caused a drop in the profits, as was usual when a new thing was introduced, and before it was got into proper working order. To get this rectified, he took an average of seven years instead of five. His third statement showed, for each of the seven years, the quantity of gas made, sold, used in works, unaccounted for, make per ton of coal purchased, quantity sold per ton of coal purchased, amount sold per cent. on make, amount unaccounted for per cent. on make, coal purchased, price of coal per ton, and sums received for residuals. For the year ending May 15, 1890, the quantity of gas made was 54,560,000 cubic feet; for the year ending May 15, 1896, it was 62,614,000 cubic feet. The average for the seven years was 58,925,128 cubic feet. For the year ending May 15, 1893, there was no record of gas made between June 26 and Aug. 15; the reason being that there was no meter by which it could be recorded. The meter was being removed from the old place to a site beside the new gasholders. The consumption during this period was estimated at the same as it was in the preceding year. He thought it was understated, rather than overstated. No record had been kept of the gas used in the works. He had estimated it at 1½ per cent. on the make, which was a usual figure. They could not get accurately from the books the quantity of gas sold. As to leakage, he had estimated it at 9¼ per cent. on the make, as Mr. M'Gilchrist had done. This might be a little under the amount; but it was not far off. The books did not state the quantity of coal carbonized, because stocks were not taken at the beginning and end of each year. The carbonizing book showed as nearly as possible the quantity. There was no record of the quantities of coke and tar sold; but he had got the amounts received for these materials. In his sixth statement, he had given a comparison of the gas made and sold in Stirling, Falkirk, and Dunfermline. The figures showed that there was not a very great difference in the quantity of gas made in the three towns. In the two years preceding the references in all the three towns, the quantity of gas made was between 60 and 70 millions. The average quantity made in Stirling from 1890 was 59 million cubic feet; in Falkirk, 62 millions; and in Dunfermline, 63 millions. The prices charged for gas in those years were: In Stirling, 3s. 7d., 3s. 4d., and 3s. 4d. per 1000 cubic feet in the last three years; in Falkirk, 4s. 2d., 4s. 2d., and 4s. 2d.; and in Dunfermline, 3s. 7d., 3s. 7d., and 3s. 7d. In 1895-96, the price in Dunfermline was 3d. per 1000 feet more than in Stirling; and in Dunfermline, it was 7d. and 9d. more. If in Stirling 3s. 7d. per 1000 cubic feet, as in Dunfermline in 1895-96, had been charged, the profits would have been increased, in 1895 by £680, and in 1896 by £690; and the average profits would have been £3705 6s. 7d. For these reasons, he had taken 4½d. as, under the whole circumstances, a fair rate to take into account in ascertaining the maintainable profit. In arriving at this, he had taken into account that the services in Stirling were of lead. Applying these principles to the figures, he found that on the reconstructed revenue accounts there was an average profit for the last seven years of £3209 12s. 5d. The average for repairs and maintenance was £641 9s. 3d., equal to 2·93d. per 1000 cubic feet. In order to bring it up to his figure of 4½d. per 1000 cubic feet, he had to add 1·57d. for repairs and maintenance, which was equal to £344 13s. 7d.; and deducting this from the £3209 12s. 5d., he arrived at a maintainable profit of £2864 18s. 10d. It was on this figure he submitted the price of the undertaking should be ascertained. The price was a matter for the Engineers. In Falkirk, the price awarded was £77,050; and in Dunfermline, £91,900. In the present case the price asked was £68,320.

Cross-examined by Mr. CLYDE: There were a number of things which should have gone against capital, but which, in the Company's books, had been placed against revenue; and he took these out, to arrive at the correct amounts. He supposed the Company did not take stocks because they had no proper man at the helm. He had assumed that the stocks at May 15, 1889, were the same as at May 15, 1896. The price of gas in Stirling had been 3s. 4d. per 1000 cubic feet for two years. In 1893 it was 3s. 11d. per 1000 feet; and for four months of 1892 it was 4s. 2d. In 1891, it was 3s. 9d.; and in 1890, 3s. 7d. He would not have expected, in view of this arbitration, that, seeing there had been a fall of 3s. per ton of coal, there should have been a reduction in the price of gas last year. In Falkirk, they seemed to think that 4s. 2d. per 1000 cubic feet was a maintainable price. The rate in Stirling was 7d. less; but the circumstances in Falkirk were in some respects peculiar. He could not tell how many of the meters were extensions, or how many were for replacement of meters in stock. He had not gone into the question of whether the number of consumers was declining. His allowance for new meters was a very small matter—£50 or so a year. He did not think it was necessary for him to take into account the number of consumers; neither did he make inquiry to ascertain to what extent the new meters represented renewals. The amount was so small that he simply put in all the meters he found purchased during a year. The sums he had dealt with in respect of wages were estimates. They were framed upon inquiry at the works and consultation with the Engineers. There were some instances in which work was done by contractors in connection with new plant; and he left them out. In Stirling, the Company lighted and extinguished the public lamps; and the price paid for the gas included the amount of the wages paid for this. In 1894-95, he made the wages bill to be £982 1s. 4d. If they added to this the £285 3s. which was carried into repairs and maintenance, and the £100 carried to capital, they found that £1367 4s. 4d. was the exact amount appearing in the Company's accounts as wages. If the wages of lamplighters were properly put on the other side of the account, to ascertain the amount of the wages at the works they would require to take from the figures appearing in his first statement under the item of wages at works and of lamplighters, the respective figures appearing on the other side as wages. The balance would show the whole wages spent in the making of gas. There had been little expenditure upon wages for storing coal; he never saw a gas-works better situated for receiving coal. "Field's Analysis" gave manufacturing charges; but the wages were not divided out. The wages of carbonizing were given, but not those of purifying. The Metropolitan and Suburban Companies were all very large undertakings. He thought that for the same wages they might do a considerable deal more work in Stirling than was shown in "Field's Analysis." He meant that the management might have been much better than it was; and the profit would then have been a good deal more. He would not say, straight off, that he would expect the wages per 1000 cubic feet to be much less in a big works than in Stirling. He had not worked out the wages for carbonizing in any way. He remembered about the facility in the Dunfermline works for getting in coal. They were extremely well arranged; but these were rather better. In Dunfermline, the cost of stowing the coal was not kept separate—at least, he had never seen it. He did not think that the amount of stowing wages in Dunfermline in 1895-96 was £191. He read the wages-book in the Dunfermline case over very carefully, and analyzed it; but he did not remember anything being in the book about purification. He would not be surprised to learn that purifying cost in Dunfermline £103 odd. As to the 4½d., his view was that if they had borrowed money, although they would have had to pay interest on it, they would have much more than recouped themselves out of the additional profit. With regard to the wages, he was told that three men were employed by the Company to do nothing else but repairs and renewals. If insurance charges were included under repairs and maintenance, they were included in his figures. He did not go through the books for the purpose of ascertaining whether what appeared under repairs and maintenance might not be something else. It was not fair to pick out an item like that. Lime might most properly be included under repairs and maintenance, because the Company did their own work; and they used lime to a considerable extent for repairs and maintenance. The only two things regarding wages applicable to new plant and machinery that he had taken out of the figures falling under this head were both arrived at by estimate. With regard to the gas made, he was dealing with what the books showed; and the books had not been cooked for the purpose of this case. They could not get the quantity of gas sold, because from the gas made they had to deduct something for the amount used in the works, and something for leakage. He declined to state the number of years' purchase that should be taken. There was no doubt whatever that the price should be ascertained by taking the maintainable profit, and multiplying it by so many years. In the case of Dunfermline, the works which were taken over were quite new.

Re-examined by Mr. CHRYSTAL: In the matter of the maintainable profit, he had adopted the position which Mr. Lass took in the Dunfermline case; and he gave no evidence on the subject. Calculating on the cost of coal, and the price charged for gas in Stirling, he had just followed the usual practice.

Mr. CHRYSTAL: You are as much entitled to assume that coal will go up, as that it will come down?

Witness: I cannot assume anything about the future of the works. Looking at the increase in the quantity of gas made in Stirling, twenty new meters in a year, costing, say, from £2 to £2 10s. each, would not be excessive. He gave a sum of about £50, which, in his opinion, was a remarkably small one. With regard to wages, what he had done was to split up, according to the best information he could get, the wages applicable to the manufacture of gas, repairs and maintenance, and capital expenditure.

Mr. *A. Gillespie*, Consulting Gas Engineer, of Glasgow, said he had valued the Stirling Gas-Works privately. He went to Stirling in March of last year to examine the works; and he reported upon them then. He found the plant in very fair working order, and capable of doing all the carbonizing, purifying, and storing of gas then needed. Looking to the site of the works, his opinion was that he did not know any so good as Stirling for future requirements. In the carbonizing department, there were three retort-benches, and 78 fire-clay retorts; and also 12 cast-iron retorts for oil. They were capable of producing about 400,000 cubic feet of gas per 24 hours. There was a fourth bench, in which there were no retorts; but it was capable of holding 36. The coal-stores could hold about 1200 tons of coal. The coal was delivered direct into the store from the railway waggons. There were three condensers, capable of passing about 500,000 cubic feet of gas per 24 hours. There were two exhausters, the larger made to pass 800,000 cubic feet per day, and the smaller to pass 360,000 cubic feet. These could be used alternately. There was a horizontal steam-engine for driving the pumps for the residual products and the smaller exhauster. The scrubber was of a good type; but it was about one-third too small. There were two groups of purifiers, capable of dealing with about 450,000 cubic feet of gas per 24 hours. The lime-stores were right over the purifiers. The station meter was efficient for 600,000 cubic feet per day. There were three gasholders, very nearly alike, of a total working capacity of about 300,000 cubic feet. There were two governors. The gas was distributed through about 21 miles of mains, of from 12 to 1½ inches diameter. The services to consumers and to the public lamps were of lead, which was unusual.

There were 4600 meters in use, of which 170 were owned by consumers. There were 393 public lamps, of which 15 were private and 378 belonged to the Company. Speaking of the works as a going concern, he thought it was a very fair plant. He was instructed to see the works again; and he investigated the Company's books, as to the manufacture and sale of gas, coke, and residuals for the seven years from May 15, 1889, to May 15, 1896. His object was to ascertain the net maintainable profit upon which the transfer should be made. He produced a table showing six other gas companies and five corporations, supplying gas under conditions similar to Stirling, as to population, maximum daily make, and annual manufacture of gas. Of the companies, Airdrie had a maximum daily make of 243,000 cubic feet, and an annual manufacture of 44,752,000 cubic feet; and the prices were: 1893, 3s. 9d. per 1000 cubic feet; 1894, 3s. 4d.; and 1896, 2s. 11d. In Ayr, there was an annual manufacture of 66,159,000 cubic feet; and the prices per 1000 cubic feet for the past five years were 4s. 2d., 4s. 2d., 3s. 9d., 3s. 9d., and 3s. 9d. In Dunfermline, the annual manufacture was 65,187,000 cubic feet; and the prices per 1000 cubic feet were 3s. 9d., 3s. 9d., 3s. 2½d., 3s. 7d., and 3s. 7d. In Galashiels, the annual manufacture was 56,310,000 cubic feet; and the prices per 1000 cubic feet were 3s. 6½d., 3s. 6½d., 3s. 4d., 3s. 4d., and 3s. 4d. In Hawick, the annual manufacture was 49,370,000 cubic feet; and the prices per 1000 cubic feet were 3s. 4d., 3s. 11½d., 3s. 6½d., 3s. 6½d., and 3s. 6½d. In Motherwell, the annual manufacture was 49,475,700 cubic feet; and the prices per 1000 cubic feet were 3s. 9d., 3s. 9d., 3s. 6d., 3s. 6d., and 2s. 11d. The average price per 1000 cubic feet in these towns was 3s. 8·5d., 3s. 9·8d., 3s. 5·3d., 3s. 6d., and 3s. 4d. In Stirling, in the same years, the average manufacture of gas was 52,614,000 cubic feet; and the prices per 1000 cubic feet were 4s., 3s. 11d., 3s. 7d., 3s. 4d., and 3s. 4d. In four of the towns, and in Stirling, a charge was made for meter-hire. Of the corporations, in Alloa the annual manufacture was 50,279,800 cubic feet; and the prices per 1000 cubic feet were 3s. 4d., 3s. 4d., 3s., 2s. 10d., and 2s. 6d. In Arbroath, the annual manufacture was 52,718,600 cubic feet; and the prices per 1000 cubic feet were 4s. 7d., 4s. 7d., 4s. 2d., 4s. 2d., and 4s. 2d. In Dumbarton, the annual manufacture was 54 million cubic feet; and the prices per 1000 cubic feet were 3s. 3d., 3s. 3d., 3s. 3d., 3s., and 3s. In Dumfries, the annual manufacture was 69 million cubic feet; and the prices per 1000 cubic feet were 3s. 6d., 3s. 6d., 3s. 6d., 3s. 4d., and 3s. 4d. In Inverness, the annual manufacture was 60 million cubic feet; and the prices per 1000 cubic feet were 4s. 7d., 5s., 5s., 4s. 7d., and 3s. 9d. The average prices in these towns per 1000 cubic feet were 3s. 10·2d., 3s. 11·2d., 3s. 9·4d., 3s. 7d., and 3s. 4·2d. The average in Stirling was 3s. 6d. per 1000 cubic feet. He deduced from these figures, that the price of gas in Stirling, at 3s. 4d. per 1000 cubic feet, was fair. The illuminating power of the gas in Stirling was from 29 to 30 candles, which was rather above the average. He had tested the gas himself. There had been a loss, he understood, of a few large consumers lately; but, on the whole, the consumption had gone up. He therefore allowed nothing in respect of the price or the quality of the gas, or of loss of business. He took 4¾d. per 1000 cubic feet of gas sold for maintenance and repairs. This figure was higher than Mr. Robertson's, because Mr. Robertson did not include repairs and maintenance of meters. Taking 4¾d., he brought out £2854 19s. 8d. as the maintainable profit, which was quite £10 less than Mr. Robertson arrived at. He took 26⅔ as the number of years' purchase. He thought that as much should be given for the maintainable profit as would enable the shareholders to reinvest in similar securities, to earn 3¾ per cent. The price he brought out for the undertaking was £76,132 17s. 9d. This was more than he valued it at before; and the reason he gave for the increased valuation was that he was not an accountant, and that in his first valuation he did his best from the books and the information he obtained. He had been guided by another consideration—the latent value of the works. He thought that a greatly increased profit could be had by a very small expenditure of capital. If the works were his, he would build a new retort-house and coal-store alongside the railway, upon the high level. By this means, he would save 3d. per ton in handling the coal. He would erect an entirely new retort-bench, on the regenerative principle. At the time of the highest make last winter, the retorts were manufacturing gas at the rate of 4400 cubic feet per mouthpiece per 24 hours. By the regenerative system, he could get not less than 9500 cubic feet per mouthpiece in the same time. He would practically get from half the number of retorts the same quantity of gas. He would not only make more gas per day, but, on account of the uniform heat, he would obtain a little more gas out of the coal. If 9000 cubic feet of gas was made per ton of coal now, he expected he would obtain 9500 cubic feet. His estimates of what might be saved were as follows: Lessened cost of labour (3d. per ton on 6500 tons of coal), £81 5s.; increased yield of gas (500 cubic feet, equal to 1s. 8d. per ton), £541 13s. 4d.; increased quantity of coke for sale (a saving of 25 per cent. in the furnaces, at 9d. per ton), £243 15s.; and increased quantity of tar and liquor from extra scrubber (100 lbs. per ton of coal, at 4d. per ton), £108 6s. 8d. This was equal to a saving of 3s. per ton, or of £975 a year. He estimated the cost of the alterations at £3500.

Cross-examined by Mr. CLYDE: The latent value of the works was not before him when he fixed the valuation at £68,320. No one put it before him. He knew of it all along; but he had not put it into the price. It was not in the price now. He allowed a reserve of about 20 retorts. Last year, the greatest quantity of gas made in one day was 396,000 cubic feet. He did not think the maximum consumption was given; he did not inquire into that. Some of the retorts were old, and nearly worn out; but he could not say how many. In their present condition, it would be necessary to keep the heats low, which meant waste in working. He did not know that the ground on which the coal-store stands, and that to the east of it, was claimed by the Caledonian Railway Company; but even if it were, there was still room for a new store. He did not look for the number of consumers; he only knew there had been an increase in the make of gas. The price of coal had come down during the past seven years. In using the oil process, the cost of the coal would be lower, because they would use a poorer sort. He excluded Hamilton, where the make was 78 millions and the price 2s. 1d. per 1000 cubic feet, because Hamilton was situated on the coal. He supposed that in England the usual figure allowed for repairs and maintenance was 5d.; but he took ½d. off on account of the services being of lead. In his first valuation, the maintainable profit he took was £2562; and he adopted the same number of years' purchase. It was the light he got from Mr. Robertson's examination of the accounts which enabled him to raise the maintainable profit. Stirling gas shares were selling at £8 3s. 6d. He thought they were a good investment. He considered there was a difference of something like a year, in the matter of purchase, between a statutory and a non-statutory company. In the Dunfermline arbitration, three years were stated; but he did not think the difference as much as that.

Re-examined: The Stirling Gas Company had been in existence for 46 years. The shares were largely held locally, by people who knew the Directors to be men of repute. He did not think it would be as safe to put money into the Motherwell or Coatbridge Companies, because these were manufacturing towns, depending upon industry; whereas Stirling was a residential town, in which the population did not fluctuate.

Monday, March 8.

The first witness called this morning was

Mr. *J. Hepworth*, M.Inst.C.E., who, in answer to Mr. CHRYSTAL, said he had visited Stirling and inspected the gas-works and the district supplied by them, which included the adjoining villages of Bannockburn and Causewayhead. The works were exceptionally well situated. The area of them was 10,444 square yards. There was a valuable siding connecting the works with the railway; and there was ample space on the site to construct plant and apparatus to manufacture quite double the quantity of gas now being made there. The works were certainly not of the most modern type; but they were in good order and condition, and the apparatus was, with one exception, quite adequate for the requirements. In some respects there was an excessive provision. He found the unaccounted-for gas to be 9·80 per cent. In Falkirk, it was 18 per cent.; and the average of the unaccounted-for gas in all the Scotch gas-works was 10·09 per cent. He quite thought that in Stirling there was a possibility of developing the consumption of gas very largely. If the Corporation secured the works, they would have an opportunity of extending their output; and the profits would increase even in a larger ratio. The shares were of a face value of £4 each. For the capacity of the works, the capital was exceptionally low. It came to £4 19s. 3d. per ton of coal carbonized, £475 per million cubic feet of gas made, and £537 per million feet sold. This was considerably less than in most of the other works in Scotland. At Dunfermline, it was stated, the capital was equal to £1047 per million cubic feet of gas sold; and the amount given in the award worked out at £1410. In Aberdeen, the capital per million cubic feet sold was £812; in Perth, it was £736; in Port Glasgow, £978; in Ardrossan, £974; in Burntisland, £1040; in Broughty Ferry, £987; and in Inverness, £1106. There were other towns in which the capital was exceptionally large and exceptionally small—for instance, in Dunbar it was £1396 per million cubic feet sold, whereas at Galashiels it was only £373. The explanation was, of course, well known to all gas engineers. On the average, the capital in Stirling was much lower than in other towns. This was because the Company had from time to time extended their works out of profits, rather than from capital. The capital of the Company in no way represented what had been expended on the works. In Stirling, the dividend charges had been within 1s. per 1000 cubic feet of gas sold. In Dunfermline it was stated the other day that the capital employed was 1s. 10d. per 1000 cubic feet of gas sold. The illuminating power of the gas in Stirling, as tested by himself, was from 28 to 29 sperm candles. In Dunfermline, it was stated to be 22⅛ candles. He took the extra cost in Stirling to be about 8d. per 1000 cubic feet, as compared with Dunfermline. He thought the price of gas in Stirling was rather below the average of other similarly situated towns. By an expenditure of £3500 upon the works, he estimated that they could effect a saving of somewhat over £1000 a year; or after providing for interest on the required outlay, of about £840 a year. This worked out at about 3·70d. per 1000 cubic feet of gas sold. No reduction in the illuminating power would be necessary; and this he regarded as an element of considerable value in the circumstances. Indeed, if the extensions had been made by the Company, the valuation would be certainly not less than £10,000 more than it had been made. He thought the engineers had shown an honest attempt to arrive at a fair and reasonable price; but both, in his opinion, were below the actual value of the undertaking. Of course, these values were arrived at, as they knew, on very imperfect knowledge. Of late statutory companies had been transferred at 28½ years' purchase, and upwards. In Edinburgh and Leith, the Companies were awarded perpetual annuities at 28½ years, which were of more value than a payment of cash down at the same rate. He was engaged in the Stourbridge arbitration, where 28·93 years' purchase was awarded. Pontypridd was sold at 29 years; Stafford, at 29; and Ilkley, at 30·93. The difference between statutory and non-statutory companies was not so much now as formerly, and was chiefly represented by the cost of obtaining an Act of Parliament. Perhaps he might add that he thought the difference in Scotland was less than it was in England. In Stirling, they should get 26⅔ years' purchase, which would be equal to an investment at 3¾ per cent. He submitted a list of the prices and sales of gas shares, which showed an average yield of £3 15s. 4d. He brought out the price of the undertaking at £76,398 8s. 10d. At this figure it would be a very cheap transfer.

Cross-examined by Mr. CLYDE: He did not hesitate to say that some of the retorts were defective; and he thought this was the reason why the whole of them were at work on a particular date last winter. The man who attended to the repair of the retorts was out of health; and this might account for their condition. He should recommend a margin of from 10 to 15 per cent.; and he thought it very likely that they had this in Stirling, but did not know how to retain it. He tested the gas twice on the previous Thursday week; and the average of the two tests was 28·64 candles. The Manager did not know that he was there. No test-books were kept in the works; but a great many scraps of paper were preserved by the Manager. He took a great bundle of them, and went through as many as he could; and the average was 28·20 candles. The photometer at Stirling was ancient; but it was a very efficient one. He certainly thought that the price of 3s. 4d. per 1000 cubic feet was maintainable. Wages would not come out so high in a works the size of Stirling as they would in London, because labour was not so dear; and in a small works the men did more general work. He thought the Company had a right to reinvestment in undertakings of a similar nature; and therefore he chose gas securities as the fairest. In the Stourbridge case, Mr. H. E. Jones, of the Commercial Gas Company, said 25 years' purchase was sufficient; but Mr. Jones had altered his view since then.

Both of them had, because the cost of an Act of Parliament had got to be pretty well understood now. All were agreed that this practically represented the difference between a statutory and non-statutory undertaking; and he thought that to allow two years was a sufficient margin to cover the cost of an Act. Statutory authority was not a great enhancement to a company, because it was open to a non-statutory company at any time to seek statutory powers.

Re-examined: The piece of ground in the works which belonged to the Railway Company was leased to the Gas Company at a rent of £1 per annum, during the pleasure of the Railway Company. It was a small strip of ground, the only use of which was for the construction of an excess coal-store; and its being taken away would not affect his view as to the capability of the site for producing twice the quantity of gas which was now being made.

Mr. *Gillespie*, re-called, said that about two-thirds of the meters used were wet, and the remainder dry. The dry meters were sent to the makers for repair; and the cost was charged to repair and maintenance of meters. He thought they repaired the wet meters themselves, and the cost would appear in the wages account.

This concluded the evidence of the Company, and witnesses were called for the Corporation. A report of this latter portion of the case will appear next week.

THE SOUTHPORT CORPORATION AND THE BIRKDALE DISTRICT COUNCIL.

The Supply of Gas in Bulk.

At the last Meeting of the Southport Corporation, a rather different complexion was put on the question of the supply of gas in bulk to the Birkdale District Council than was given to it by speakers at a recent meeting of the latter body (see *ante*, p. 546). Reference was made to the negotiations in the Gas Committee's minutes, the adoption of which was moved by Mr. Dimond, and seconded by Mr. Dewhurst. The latter gentleman considered it only fair that some of the statements made at the meeting of the Birkdale District Council should be contradicted. It was stated that Southport wanted all, and would give nothing. As a member of the Sub-Committee, he could say with every truth that Southport offered terms such as no private individual would have done. Almost everything Birkdale wanted, except 1d. per 1000 cubic feet, they offered to grant. Mr. Travis informed the Council that one of the resolutions adopted by the Sub-Committee was to agree to supply gas at the borough boundary at a profit of 4d. per 1000 cubic feet, which meant on the present prices something like 2s. 6d.; while they might have charged 4s. 6d. Alderman Fisher thought this way of putting it was not quite fair. After receiving the gas at the boundary, Birkdale would have to add the cost of maintaining their mains, making connections, and collecting the rate, before they could arrive at the prime cost. Alderman Griffiths said they certainly offered gas to Birkdale at 2s. 6½d. per 1000 cubic feet at the boundary; and they reckoned the cost of production at 2s. 2½d., adding 4d. by way of profit. The charge to the consumers ought to be very different from the 3s. 6d. per 1000 cubic feet mentioned at the Birkdale meeting. Alderman Griffiths said the great advantage which they considered Birkdale would gain by this arrangement was in having the matter in their own hands. So far as he knew, there had never been an instance in which any gas authority had supplied an out-district on such terms as the Southport Corporation had done for the last twenty years—he had never known an instance where such a rebate was given. They had always been generous towards Birkdale; and he thought the Birkdale people had made a great mistake. The minutes were adopted.

LEICESTER CORPORATION GAS, ELECTRICITY, AND WATER UNDERTAKINGS.

The Half-Yearly Reports.

At a Special Meeting of the Leicester Town Council last Wednesday, the Committees having charge of the above undertakings submitted their reports for the half year ending Dec. 31 last.

The Gas and Electric Lighting Committee stated that their accounts for the six months showed a net profit, after paying interest on the capital of the undertaking, of £13,324. Out of this had been paid £3244, the half-year's amount of sinking fund, leaving a balance of £10,080 which, added to the balance of net profit (£8309) for the half year ending June 30 last, made a total of £18,389 to be applied to the district fund at the close of the current financial year (the 31st inst.), or from which the Council might, if they so minded, increase the present reserve fund of £5000, or appropriate or set aside a sum to be applicable for the renewal of works. The Committee recommended that the total net balance of £18,389 be applied to the district fund. They also reported that the accounts of the electric lighting undertaking for the half year showed that the result of the working, after paying interest on capital and £579 on account of sinking fund, was a profit of £457. Deducting this amount from £2060 loss to June 30 last, left a net loss in connection with this department of £1603. The total amount which had been paid on account of sinking fund was £2500.

On the motion of Alderman Lennard, seconded by Mr. Billings, the portion of the report referring to the Gas Department was adopted.

Alderman Lennard then moved the adoption of the section of the report alluding to the electric lighting undertaking; expressing the hope that, at the end of 1897, they might retrieve in profit the loss on the first year's working. There had been a steady increase during the four half years that the electric light had been supplied.

Mr. Clarke asked if anything was to be done in the way of lighting the streets by electricity.

Mr. Royce said that came within the province of the Watch Committee, who had considered the matter, and did not intend to light the streets by electricity.

Alderman Lennard pointed out that no profit would be derived; and they wanted to make the department a commercial success. Electric lighting was not economical for streets; but the method of burning gas might be much improved. They were, however, prepared to supply electricity to the Watch Committee if called upon to do so, but as yet were not so favourably circumstanced as other towns to make it pay.

The motion was agreed to.

The Water Committee reported that their accounts showed a deficiency, after paying interest and sinking fund on the capital, of £1007. Deducting this from £2507, the balance of net profit for the half year ending June 30 last, the total profit for the year would be £1500; and the Committee recommended that this amount be paid to the district fund at the close of the current financial year. The quantity of water delivered during the year within the limits of supply was 1,176,833,728 gallons; and the average consumption per head per day 14·96 gallons, including the quantity supplied for trade purposes. The number of houses on the books at the end of December was 43,662; giving an estimated population of 218,310, or an increase at the rate of 2·39 per cent. per annum.

On the proposition of Alderman Coleman, the report was adopted.

LEEDS CORPORATION GAS DEPARTMENT.

Large Diminution in the Half-Year's Profits—The Labour Troubles.

The gross profits derived from the Leeds Corporation Gas-Works during the six months ending Dec. 31 last, amounted to £12,030. Deducting from this £5588 as sinking charges, left the net profits at £6442. During the corresponding period of 1895 the net profits exceeded £17,000. The diminished balance is attributed to the reduction of 2d. per 1000 cubic feet in the price of gas, which is said to represent about £10,000, and to a falling off in the amount obtained for residuals to an extent of something like £2000.

Reference was made at the meeting of the Gas Committee last Thursday to the difference of opinion which has arisen as to the work to be performed by the men in the machine-operated retort-houses at the New Wortley station. A letter was read from the Gas Workers' Union suggesting a compromise; but in view of the fact that the Committee intended giving (yesterday) a month's notice of a new set of rules and working conditions respecting the men employed in the machine-stoking departments, they decided to allow matters to remain as they are for the present. Concerning the dispute in the pipe-laying department, in which, it will be remembered, the Committee had consented to submit to arbitration the question whether they were justified in discharging a workman named Taylor for alleged incompetence, it was stated that the man had resigned—a course which will render the arbitration proceedings unnecessary.

THE GROWTH OF THE READING GAS COMPANY.

The members of the Reading Literary and Scientific Society paid a visit to the Reading Gas-Works on the 10th inst.; and there heard from the Chairman of the Company (Mr. J. O. Taylor) an account of the development of the concern. Mr. Taylor, having welcomed the party, said he was old enough to recollect when the use of gas was extremely limited, and when the quality supplied was very different to that now manufactured. He believed gas was first introduced into the town about 1812, when it was considered a great achievement to produce as much as 4000 cubic feet of gas per ton of coal. After many years a second Company was established, and, like the first, proved unsuccessful; but in 1862 the two concerns were amalgamated. At that period the total consumption of gas in Reading was about 40 millions per year. The coal was brought by horse and cart from the railway to the works; while an order of 100 tons was considered a large one. Forty years ago, the consumers were paying something like 6s. per 1000 cubic feet. But from the time of the amalgamation of the two Companies, a change came; and there had been a gradual growth not only in the population of the borough, but also in the average consumption, so that in 1896 they sold 360 million cubic feet. The works were in educated hands, having been under the entire control for the past 30 years of Mr. Edward Baker, who had designed every detail of the present works. Under his excellent management, the Company had advanced stage by stage until now not only was the gas produced a pure illuminant, but every ton of coal yielded 11,500 cubic feet; so that they could sell (and make a good profit) at about one-third of the price which was charged 40 years ago, when no profit was obtainable by the shareholders. Mr. Herbert Baker and other members of the staff then conducted the visitors around the works. Some interesting comparisons were subsequently made of different forms of artificial light. Sets of incandescent gas-lights, electric lamps, and ordinary gas-lights, had been arranged, of exactly equal nominal candle power; and these were successively turned on and off, while Mr. Taylor explained their relative cost. His figures worked out to this—that it would cost £1 to obtain as much light by means of electricity as could be purchased for 8s. 4d. in ordinary gas; while by spending 6s. 10d. on the incandescent gas system, two-and-a-half times more illuminating power would be obtained.

A Joint Water Scheme for Brampton (Carlisle) Rural District.—The Brampton Rural District Council have adopted a scheme for the water supply of Castlecarrock, Hayton, and Irthington from the Tarnmonarth springs; the estimated cost being £7200.

Tiverton Corporation and their Gas-Works.—The formal transfer of the Tiverton Gas-Works to the Corporation was completed last week; and on Wednesday the members of the Town Council were invited by the Lighting Committee to visit the works. The Manager (Mr. W. Littlewood) received the visitors, showed them over the establishment, and explained the process of gas manufacture. He said the plant was to a certain extent old; but if modernized, the works would be beneficial to the ratepayers. They needed increased storage; and they ought to provide for at least a 24 hours' supply. The largest day's consumption during the present year had been 35,000 cubic feet; and last year it reached at one time 40,000 cubic feet. Mr. J. Thorn, the Chairman of the Lighting Committee, explained the circumstances under which the transfer of the works had taken place; and expressed his appreciation of the attitude of the vendors throughout the negotiations.

GAS AND ELECTRIC LIGHTING IN THE CITY OF LONDON.

The report of the Engineer to the Commissioners of Sewers of the City of London (Mr. D. J. Ross, M.Inst.C.E.), on the works executed by them during the past year, has just been issued. It contains, as usual, particulars in regard to the lighting of the City streets by gas and electricity. The number of gas-lamps now paid for by the Commissioners is 1875; more than one-third having been removed in consequence of the main thoroughfares being lighted by electric lamps. The charge for gas is 2s. 3d. per 1000 cubic feet; and it comes to £2 8s. 4d. per annum for the lamps burning 5 cubic feet per hour, £2 18s. for those burning 6 cubic feet, £4 16s. 9d. for the 10-feet, £7 5s. 1d. for the 15-feet, £9 13s. 6d. for the 20-feet, and £24 3s. 9d. for the 50-feet lamps. The majority of the lanterns are circular. The annual charge per lamp, including lighting and repairing, ranges from £3 6s. 4d. to £10 15s.; the 50-feet lamps (gas and lighting only) costing £25 13s. 9d. There are 36 meters attached to the public lamps in various parts of the City. They show that the full contract quantity of gas is furnished to them; and the Inspector of Gas Lighting and the Inspectors of Pavements are of opinion that it is given generally throughout the City, and that the regulators are kept in proper condition. The number of defective gas lights observed during the past year was 92. The returns in this matter are made to the Commissioners daily by the City Police; and they include only those lamps in which defective lighting is very noticeable. An experiment was made in Wood Street with the incandescent system of gas lighting. On the 15th of May, 17 lamps were fixed; and they have been in use ever since. The consumption of gas by these burners is 4 cubic feet per hour. The cost per annum averages about £4 7s. 3d. each; and of the ordinary square pattern gas-lamps £3 6s. 4d. each, including cleaning, lighting, and maintenance. The lighting of the main thoroughfares of the City with arc lamps was continued throughout the year; the number in use at the end of December being 493. The number of defective electric lamps observed during the year was 4905. These returns are made to the Commissioners daily by the Police; and the Electric Light Company are fined for each failure. Both the Gas and the Electric Light Company, acting upon general instructions in force for many years past, lighted the public lamps throughout the year whenever fog or unusual darkness prevailed. This occurred on six days.

OTTOMAN GAS COMPANY, LIMITED.

The Ordinary Half-Yearly Meeting of the above Company was held last Tuesday, at 9, Queen Street Place, E.C.—Colonel James Le Geyt Daniell presiding.

The Secretary (Mr. T. Guyatt) read the notice calling the meeting; and the report and accounts, to which reference was made in the "Journal" for the 9th inst., were then presented.

The Chairman first expressed the regret of the Board at the absence of their esteemed Chairman, Mr. A. J. Dove; his advancing years and affection of health having, he said, rendered it impossible for him to be present. Turning to the report, he next referred to the statement therein as to the retirement from the Board of Mr. J. Orwell Phillips through ill-health. Connected as most of the shareholders were with kindred concerns, they would readily, he remarked, recognize what a loss Mr. Phillips was not only to the Board but to the Company. He was a man of great ability and experience; and, at the meetings of the Board, it had always amazed him (the Chairman) to witness the great patience with which he would listen to his colleagues who had had much less experience. Mr. Phillips was told by his medical adviser that it was imperative he should contract his engagements; and, though he opposed this advice for a certain time, he was at length obliged to send in his resignation, loath as his colleagues were to accept it. While it was unnecessary to pass any formal resolution, he (the Chairman) felt sure that he would have the approbation of the shareholders in expressing on their behalf, when next he saw Mr. Phillips, their regret that he had been compelled to relinquish his part in the direction of the Company. (Hear, hear.) In filling the vacancy, the Board had not far to look for a gentleman who had that practical knowledge which they conceived to be necessary for the proper administration of the affairs of the Company—and not only knowledge of the business of gas supply, but of business as conducted in the Ottoman Empire. They offered the seat to their late Consulting Engineer (Mr. H. W. Andrews), who previously for nearly seventeen years was the Engineer and Manager of the Company in Smyrna; and he accepted it. He (the Chairman) was sure that every shareholder would agree that they had made a right selection. Turning to the accounts, he said that, on making a comparison between the figures of the past half year and those of the second half of 1895, it would be found that there was little difference. There was one item upon which he wished to speak, and that was the Directors' fees. He had not consulted his colleagues on the subject; so that anything he said must be accepted as emanating from him alone. He found that, in the Articles of Association, the Directors' remuneration was put at £1050, and was never to be less than £700. A resolution was passed in April, 1874, asking the Directors to take £300. In those days, they were paying a dividend of 3 per cent.; but in 1881, they had risen to 5 per cent., and in 1883, to 7 per cent., which had been continued up to the present time. They had now five Directors, who were only taking £300 a year, which, in his opinion, was not a fair remuneration. He intended talking the matter over with his colleagues at their next meeting. Therefore he wished to prepare the shareholders for an increase in the present half-year's accounts; and he was confident they would approve of a modest advance. With reference to the item of coal, it would be seen that it was slightly more; but they had had an increase in the quantity of gas made. The public lamps were practically the same. From the profits, it was proposed to add £1000 to the reserve fund, and to pay a dividend of 7 per cent. on both classes of shares. He concluded by moving the adoption of the report.

Mr. Charles Gandon, in seconding the motion, said, considering the disturbed state of Turkey, it was very satisfactory that they were enabled to show, in the past half-year's accounts, a profit nearly equal to that of the corresponding half of 1895.

Mr. A. Skaife inquired whether the disturbed state of the Ottoman Empire accounted for the decrease in the profit, and whether it had affected the bad debts.

Mr. Gandon replied that he did not think the present state of the Turkish Empire had directly contributed to the reduction of the profits; but it must have stagnated trade to a certain extent, which would have some influence on the Company's business. The bad debts were only about £9 more.

Mr. W. Hughes concurred in the Chairman's remarks as to the Directors' fees; and said he certainly thought all the shareholders would acquiesce in some increase being made. At the same time, he suggested that the Board should take into consideration an addition to the Secretary's salary.

The motion was unanimously adopted.

A resolution was then passed, adding £1000 to the reserve fund (making the sum at the credit of that account £11,000), and declaring a dividend at the rate of 7 per cent. per annum, free of income-tax.

On the motion of the Chairman, seconded by Mr. Stephenson R. Clarke, the retiring Directors (Messrs. Dove and Gandon) were re-elected; and afterwards the Auditors (Messrs. C. K. Butt and T. H. Cooke) were re-appointed.

On the proposition of Mr. J. L. Chapman, seconded by Mr. Cooke, a hearty vote of thanks was passed to the Chairman and Directors. The services of the Secretary, the Engineer and Manager (Mr. John Gandon), and the staff were also duly acknowledged.

THE RECENT FATAL GAS EXPLOSION IN BOSTON (U.S.A.).

A Boston paper of the 5th inst. which reached us last Thursday contained additional particulars occupying several columns, in regard to the calamity briefly recorded in the "Journal" last week (p. 600). Two accounts of the catastrophe were there given; and serious as it unquestionably was, it was not so fatal as the second story made out. The explosion took place just before midday on the 4th inst.; and it is regarded as the most terrible one in the history of the city. It occurred in the subway at the corner of Tremont and Boylston Streets; and its history is given as follows: In the present method of subway construction, there is left a space of 4 feet between the subway roof and the temporary planking. Into this space, gas leaking from mains had been filtering for some time. The mixture of air and gas had reached explosive proportions; and it became ignited from a spark from a Mount Auburn car which was passing, or from a temporary arc formed by an imperfect connection in the return circuit of the electric cable under the tracks. The exploding gas burst forth with a loud report, which was followed by smoke and flames; and the air was filled with flying glass and *débris*. As the smoke cleared away, the scene presented was shocking, as it looked for a moment as if the whole subway at that point was in flames. In a moment the passers by, recovering from the shock, ran to the rescue of the passengers; and the Fire Department, ambulances, and police were quickly on the spot. Two cars were at the curve of the road; and both were badly damaged. The whole width of Tremont Street was thrown up at the juncture of Boylston Street; and several holes were made in the pavement some hundred feet away. When the firemen arrived, the explosion was over; but they found a lively spurt of fire. All the pent-up gas had been consumed at the first outburst; but a steady stream was pouring out of the broken mains. This ignited, and made a flame 8 feet high, which burned the cars and horses lying practically above it. The firemen found they could do nothing till the supply was cut off; and this was done as soon as practicable. Altogether, three street cars, a *coupé*, and a public carriage were burnt, six persons were killed, and about forty badly injured. The damage is estimated at $50,000.

The Mayor of Boston has made a statement in regard to the accident. In the course thereof, he says: "The accident was undoubtedly caused by the escape of a large amount of gas from the pipes of the Boston Gaslight Company, probably from a 6-inch and an 8-inch main, extending east and west across the subway in the line of Boylston Street. Two breaks were found in the 6-inch, and one in the 8-inch main. There was an open space of about 2 feet between the temporary plank surface of the street and these gas-pipes. This space became partially filled with gas; and the spark caused by an electric car in passing over the rails was doubtless the cause of ignition. The seriousness of the accident was due to the fact that this open space permitted the accumulation of a considerable volume of gas. If the construction work had been completed, and the street surface had been restored to its original condition, no such explosion could have occurred, even though there had been the same leak or break in the gas-mains, because there would have been no chamber in which the gas could collect. It will be very difficult to determine whether one or all of the three breaks found in the 6 and 8 inch mains occurred prior to the explosion or were caused by it. One theory, which seems to be supported by a good deal of evidence is that the gas reached the open space through leakage some hour or two before the explosion took place; and that the fractures in these mains must have been caused by the disturbance of timbers resulting from the explosion. It does not seem likely that gas could have been escaping very long through an opening in either a 6-inch or an 8-inch main as large as the fractures which were found after the explosion, without causing a more powerful smell than was noticed, as there were sufficient cracks and openings in the plank surface to permit a large escape of gas into the air. This view seems also to be strongly corroborated by the record of the automatic pressure register in the office of the Boston Gaslight Company which I have examined. This indicates that the normal pressure in the mains did not drop until just about the time of the explosion, when it rapidly diminished. The Engineer of the Gas Company states that any one of these three fractures would have caused a marked diminution in pressure as soon as it occurred. The pressure-register does not, however, indicate the time with sufficient accuracy to make it possible to say whether on this theory these breaks occurred a few minutes before the explosion or contemporaneously with it; and it may be impossible ever to determine whether some extra strain or subsidence caused the fractures, or whether they were due to the explosion. The accident must have occurred through an extraordinary combination of circumstances. All questions of responsibility will have to be settled between the Boston Gas Company and the

Metropolitan Construction Company, who had the contract for building this section of the subway."

The following is the Gas Company's story: "Between 11 and 12 a.m., someone telephoned to the Company that there was a leak in the Masonic Temple. The receipt of this telephone message was duly recorded, and sent to the jobbing department. As soon as the first jobber, named Green, came back—that is, at 11.40—he was sent to ascertain what the complaint was. But while he was on his way to the Temple—that is, at 11.44—the explosion took place. Almost at the same moment that he started for the Temple, a report was made to the street-main department in the basement of the Gas Company's building by William Monagle, an employee of the Company, whose duty it has been for months, under a special assignment, to patrol the gas-mains on the lines of the subway, and to especially see, by actual operation, that the valves upon the mains on the subway were in proper working order, and not covered by building material. Some of this street gang started with Monagle, so that they were going to the corner of Boylston Street at the same time that Green was. But before anyone arrived there from the Company, the explosion took place. The explosion was heard at the Company's office; and immediately all the officials, consisting of the President (Mr. A. C. Burrage), the Treasurer (Mr. F. P. Addicks), the Chief Engineer (Mr. W. R. Addicks), and the Distributing Engineer (Mr. J. A. Gould) rushed to the scene. Within two minutes from the time of the explosion, the Engineers and the street-main force of the Company were at work shutting off the gas, and doing everything that could be done. The Engineers have made as thorough an examination of the situation as could be done under the circumstances; and they find that at the exact junction of Boylston and Tremont Streets, both the 6-inch and 8-inch mains of the Company, running through Boylston Street, are broken—the 6-inch in at least two places, about 12 feet apart; and the 8-inch once, at the exact intersection of the two streets, immediately under the central point of all of the intersecting street-car tracks on these two streets. Both of these mains contained gas, and crossed over the top of the two subways running up Tremont Street at this point. So far as the Company have any information, these pipes have been in perfect condition; and even now all the joints of both of them are in a perfectly sound state. The breaks are evidently clean, sharp fractures in the pipe, and in no case at the joints; thus showing that there was no defect in the pipe or joints. During the construction of the subway, these pipes have been supported by those building the subway. At this particular point, although the subway itself was practically completed, the space between the top and the street surface was open, except for timbers, iron beams, and planks supporting the car tracks and planks on the street surface. This space has been left open for months, and was still open, in order that the final work, such as waterproofing, &c., which has to be done upon the top of the subway, should be finished. The Gas Company, have been doing no work there. The breaks were sudden and sharp; and gas must have accumulated in this air space, and the explosion must have been caused by a spark from the street railway tracks or wire igniting the explosive mixture of gas and air coming up through the cracks between the planks. It is evident to the Engineers that these fractures of pipes were not caused by any operation of the Gas Company, and that, whether produced by the weakness of the supports put in by those at work there, or by some extraordinary weight of cars and tracks, or by general settling of the ground at this point, they could not have been prevented by any action of the Company."

The question now arises as to who is responsible. According to the account contained in the paper to hand, it is the opinion of most lawyers that the City will be held liable for injuries to person and damage to property occasioned by the catastrophe. The riders in the cars will, it seems, have claims upon the Car Company, who will also have cause of action against the City. So that it may be expected that the Courts will be busy over this disastrous occurrence. In the meantime, there will be a searching inquiry into the whole matter. The Chairman of the Board of Gas and Electric Light Commissioners (Mr. F. E. Barker) promptly visited the scene of the explosion, and stated that the Board would certainly investigate the affair unless the Legislature saw fit to entrust it to a Special Commission appointed by themselves. This being the case, judgment must be suspended; and the subject left with an expression of regret at the lamentable loss of life which was caused. Curiously enough, practically no damage was done to the subway, nor were the water-pipes injured; but the destruction of glass was considerable.

ELECTRIC LIGHTING NOTES.

Mr. Alderman Gibson submitted to the Manchester City Council last Wednesday a proposal that the Electric Lighting Sub-Committee of the Gas Committee should be appointed a standing Committee as from the 31st inst. In showing the necessity for this change, Alderman Gibson stated that they had invested £300,000 in the electric light undertaking; the Council had already sanctioned the borrowing of an additional £160,000; and they would soon want more. With regard to the probabilities of electricity becoming a powerful competitor with the gas undertaking, he was happy to be able to assure the members that there was no ground for alarm. It was pointed out by Mr. Saxon that there were now sixteen separate Committees; and he protested against increasing the number. He also moved that the matter be deferred for twelve months. Mr. Chesters Thompson seconded the amendment. Alderman Gibson added to his previous information that the electric lighting undertaking commenced three years ago with 8000 16-candle lamps; and now the number was more than 70,000. The development was so wonderful that the Board of Trade were astounded at it. No city in the kingdom was going at the same rate, or making the same profits, as Manchester. The first year they covered expenses; the second, they reaped a handsome profit; and last year they gave £11,000 to the rates, and reduced the cost to the consumers by 25 per cent. This year they would lower the cost another 25 per cent., and give the city more towards the rates. The new light would be within reach of every man in a few years; and there was no fear as to the gas undertaking. The original motion was carried.

The Gas, Water, and Electrical Committee of the Birkenhead Town Council have adopted a scheme for the extension of the electric lighting system to suburban parts of the borough—principally to the important residential districts of Oxton and Claughton. It is recommended that application be made to borrow £20,000 to fully carry out the project.

On the working of the Coventry Corporation Electric Lighting Department last year, there was a debit balance of £41. In addition, the interest on the capital amounts to £895, and the payment on sinking fund to £770, which makes the total charge on the rates £1706.

The Chester Town Council last Wednesday authorized the Electric Lighting Committee to order additional plant for the generating station at a cost of £8530. It was also agreed to apply to the Local Government Board for sanction to borrow £20,000 for extension purposes.

In the last volume of the "JOURNAL," we called attention to the outspoken utterances of the Mayor of Redfern—a borough adjacent to Sydney—on the subject of the electric lighting of the town. His Worship had always been an opponent of the local Gas Company; but he had come to think that if the Corporation had endeavoured to get hold of their undertaking instead of dabbling in electric lighting, they would have been in a better financial position. We do not refer to this matter for the purpose of mentioning any further pronouncement on the part of the Mayor—his opinion, no doubt, being quite settled—but only to record a little incident which took place at the meeting of the Town Council on the 8th ult. The question under discussion was the granting of an allowance to the Mayor for 1897-8; and £100 was suggested. At the first glance, it seemed as though a cypher must have been omitted by the printers; but this was not so. The proposer of this overwhelming honorarium urged that, in view of the shrinkage in the revenues of the borough, and of the fact that the various officers' salaries had been reduced, the Mayor's allowance should suffer a reduction. The amount suggested was surely small enough; but another worthy councillor thought it should be nothing at all, as someone could, he said, be procured who would discharge the duties of the position for the "honour and glory" attached to it. Then an alderman came forward with a proposal that the amount should be £150, as he thought £100 would be too small to be worth receiving. He said that, considering the amount of trouble the Mayor was put to, not only as regards the usual work attached to ordinary councils, but in attending to the management of the funds received from that "terrible humbug, the electric light system" in order to make the outlay come to something near the income, he was not paid a penny too much when he received £200; but while moving that £150 should be granted, he was in favour of again sending back the question to be answered by the ratepayers, as had been previously done, by a *plébiscite* vote. This course was adopted. It is to be hoped they will deal with the matter in no niggardly spirit.

Last Thursday, the Hampstead Vestry accepted and approved the following statements of their Electric Lighting Committee in regard to the fatality alluded to in the "JOURNAL" last week: "That they had to record with very deep regret the death, by electric shock, of H. White, a joiner's labourer in the employ of the Vestry, in a sub-station, on the 6th inst.;" and "That they had instructed the Vestry Clerk, without prejudice, to see to the funeral of the deceased being carried out in a becoming and efficient manner at the expense of the Vestry, and to take steps to relieve any immediate necessities of the widow." The Chairman of the Committee then moved a vote of condolence with the widow and family; and it was unanimously carried. In the course of his speech, he declared that this accident was totally unprecedented in the annals of electric lighting; but it had opened the eyes of the Engineers to the liability to accident, and to the necessity for the adoption of means that would render such occurrences utterly impossible in future. Mr. Harben, the Chairman of the Vestry, remarked that "practically impossible" would have been a happier phrase. Unfortunately, this makes the second death at the Hampstead installation within a comparatively short time; but no suggestion of a thorough investigation has come from the Vestry.

Something went wrong with the electric light at Exeter on the evening of last Sunday week, with the result that some of the places of worship were thrown into darkness in the midst of the service. At St. Sidwell's Church, the wise precaution had been adopted of retaining the gas-fittings; and, as a local paper puts it, "fortunately the gas was at once available, and thus any serious inconvenience was averted." It was otherwise at a neighbouring chapel and mission hall. In neither of these was the gas laid on. When, after some premonitory warnings, the electric light went out, and the distressed stewards had pressed the buttons and shaken the wires without result, a hurried search had to be made in the neighbourhood for candles and lamps. The local newspaper men try to extract some fun from the ludicrous spectacle of the chapel dignitaries racing into the street begging and borrowing lamps and tallow candles, and the congregation holding the latter—some in candlesticks and some not—while a better means of illumination was being discovered. "I have some gas shares," says a correspondent who describes the scene in the mission hall. "I thought to sell them; but after Sunday night's experience, I think I will put them back in the safe again."

The Price and Consumption of Gas at Caterham.—As mentioned in a paragraph which appears elsewhere, the Directors of the Caterham and District Gas Company have decided to share with their customers the results of their improved business by reducing the price of gas 3d. per 1000 cubic feet, as from the 26th inst. The Company's Manager and Secretary (Mr. G. W. Anderson, Assoc.M.Inst.C.E.) has been making considerable progress of late, as will be seen from the following figures: In 1891, after an existence of twenty years, the Company had 168 consumers; now there are 373—an increase of 105 ordinary, apart from "slot meter" consumers. This is simply the result of more liberal treatment. While the business has in about five years augmented to the extent of 50 per cent., the capital is only 17 per cent. greater. The additional consumption of gas in the present quarter has been 15 per cent. The Company have adopted the system of charging at a lower rate for all gas consumed beyond the previous quantity; and for this the figure is 3s. 6d. This "extra gas" amounted last year to 16 per cent. of the total consumption. A hundred of the consumers have their supply through prepayment meters; and taking the past nine months, the average amount of gas burnt through these meters has been 1500 cubic feet per month. In six weeks, a sum of £42 was taken from 80 meters. As the Company intend having an exhibition of gas-stoves in April, a further impetus will doubtless be given to the development of the business.

LONDON COUNTY COUNCIL.

The Resignation of Mr. Dibdin—The Welsh Water Scheme.

At the Meeting of the London County Council last Tuesday, the General Purposes Committee reported that Mr. W. J. Dibdin had expressed a wish to resign his post as Chemist to the Council. Mr. Dibdin, in a letter dated March 2, had stated that he had for some time past been desirous of engaging in private practice; and, as the resolutions passed by the Council from time to time denied him this privilege, he had been compelled to consider his position, and found that he was well advised in tendering his resignation. The Committee felt sure that it would be with considerable regret that the Council would lose the services of so valuable and able an official. They recommended that the Council accept Mr. Dibdin's resignation with regret, and that the resignation should take effect from June 30 next. Dr. Cooper referred to the great value of Mr. Dibdin's services to the Council, and moved, as an amendment to the recommendation, that it should be referred back to the Committee, with a view to their seeing whether some steps could not be taken in order to retain Mr. Dibdin's services. Dr. Longstaff seconded the amendment. Mr. Cornwall expressed the hope that the amendment would not be pressed. The question between the Council and Mr. Dibdin was entirely one of private work. When an officer made application to be relieved of his office in order to go into private practice, because the Council would not allow him to do so, he thought it was unwise and undignified to make further efforts to retain his services. Dr. Cooper thereupon withdrew his amendment; and the Committee's recommendation was agreed to.

The Water Committee recommended that the Engineer (Mr. A. R. Binnie, M.Inst.C.E.) should be instructed to proceed with the plans and sections of the Wye portion of the Welsh scheme of water supply; and that they should be authorized to incur an expenditure of £1500 for this purpose during the financial year ending March 31, 1898, subject to the passing of the annual maintenance vote. In answer to Colonel Ford, Mr. Dickinson, the Chairman of the Committee, said they hoped, either at their next meeting or the subsequent one, to have before them the report of Sir Benjamin Baker and Mr. G. F. Deacon on Mr. Binnie's scheme for bringing water to London from Wales. Mr. R. A. Robinson moved, as an amendment to the Committee's recommendation, that it should be referred back for further information. He did not want the Council to spend another £1500 on the survey of this district. The more this scheme of bringing water from Wales to London was being considered, the more the ratepayers of London were coming to the conclusion that it was not necessary for them to go so far for water when it could be secured from the Thames. Dr. Longstaff seconded the amendment, thinking it was better that the Council should, before sanctioning this expenditure, wait for the report of Sir Benjamin Baker and Mr. Deacon. The matter was not urgent. Mr. Idris said the matter was urgent in this sense—that all the available sources of supply were being rapidly appropriated. Sir J. Lubbock, M.P., thought the proposal of the Committee somewhat illogical. Only the previous week they had Bills in the House of Commons providing for the purchase of the undertakings of the Water Companies. It was obvious that this purchase would have been a very bad bargain if it was necessary to go to Wales for an additional supply; and it now appeared that in the opinion of the Committee this would be necessary. For his part, however, whatever the inconsistency of the Committee might be, he thought it was important to obtain the information contemplated. Unfortunately, the water supply of the country had hitherto been dealt with piecemeal. Each city had been allowed to help itself without reference to the general interests of the country. He thought the question should be dealt with as a whole, so as to utilize the entire water supply in a way that was best for the general interest of the country. After some further remarks, the amendment was negatived on a show of hands, and the recommendation was agreed to.

THE WORK OF THE BELFAST WATER TRUST.

A Special Meeting of the Belfast City and District Water Commissioners was held last Tuesday for the purpose of electing a Chairman and Vice-Chairman for the ensuing year. Before commencing the business, Mr. R. J. M'Connell, J.P., who has occupied the chair four years in succession, reviewed the work of the Commission during that period—the greater portion of his remarks being, of course, directed to the great water-works scheme at Mourne. The Bill for this was promoted in 1893; and the Commissioners then obtained, what is to-day, a record Act. Owing, he said, to the agreements entered into with the millowners on the different streams, the Commissioners were enabled to impound all the waters—a thing hitherto unknown; and by this arrangement they were able to effect a saving of capital expenditure of at least £80,000 for storage purposes. The Commissioners also took power to buy the catchment area, consisting of from 7000 to 8000 acres, which would prevent for all time any possibility of contamination. The quantity of water available would be ample; and the works, when fully developed, would be capable of furnishing a supply of 30 million gallons per day. The vastness of this supply would, said Mr. M'Connell, be understood when it was recollected that the present total requirements of the city were under 11 million gallons per day. The works at present in hand were intended to bring in a first instalment of 10 million gallons a day. He had no doubt they would be completed within the contract period, which expired in 1900. Notwithstanding the enormous sums spent, the Commissioners had not increased the rates beyond 1s. in the pound. As an instance of the development of the Trust, he mentioned that in 1892 the amount of water sold for special purposes was 533 million gallons; and in 1896, 767 millions—being an increase of upwards of 40 per cent. The revenue from special purposes for these years was respectively: £22,853 and £28,776; and the valuation assessed for water-rate was in 1892 £796,642, and in 1896 £1,001,290. He also referred to the success of the consolidation of the city debts and issue of stock. The members, he said, would recollect that the Board were the first in the city to take advantage of the better terms to be obtained by putting this form of stock before the public. They had been most fortunate in their transactions in this department; and he might mention that the last issue of £250,000 was successfully floated at the high price of £105 for 3 per cent. stock. He concluded his remarks with a short reference to the Bill which the Commissioners have in Parliament this session. The members then proceeded to the appointment of Chairman and Deputy-Chairman—their selection falling upon Mr. John Laird for the former office, and Mr. E. W. Pim for the latter. A vote of thanks was passed to the ex-Chairman, on the motion of Sir W. M'Cammond, who said Mr. M'Connell had saved the ratepayers many thousands of pounds by his experience as a financier; and he believed he was the only gentleman who had occupied the chair of the Board four years in succession.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Sheriff Lees has been very prompt in disposing of the reference to him to fix the price of the Stirling Gas Company's undertaking. It was only this day week that he completed the hearing; and on Wednesday morning his decision was made known in Stirling. The question before him was whether the price should be £61,130, as fixed by Mr. M'Gilchrist for the Corporation, or £68,320, as settled by Mr. Gillespie for the Company, or any sum between. The Sheriff has awarded £62,697 10s. 11d. Most probably he will not disclose the principle upon which he proceeded in arriving at his decision; and, like Mr. M'Gilchrist, he may have arrived at it in one way, and checked it by other methods. It is only surmise on my part, but there is this very suggestive in it—that he has worked out the sum to shillings and pence. It is evident that his leading principle was not to give so much per 1000 cubic feet of gas sold, because this would have come out at even figures. He may either have taken a mean of the prices spoken of as having been realized for Stirling gas shares (which were said to be more than £8 each), and calculated out a sum to give a certain return; or he may have taken a mean of the figures which were spoken to as the maintainable profit, and allowed a certain number of years' purchase. If this latter be considered, it is found that for the Company the maintainable profit was spoken to as £2864 18s. 10d. by two witnesses, and as £2854 19s. 8d. by the third witness. The mean of the three is £2861 12s. 5d. For the Corporation, the maintainable profit was spoken to by one witness as £2729 2s., and by another as £2601 15s. 6d. Unfortunately, I cannot find in my notes that Mr. Millar, the Accountant for the Corporation, named a figure as maintainable profit; but Counsel argued that, upon his basis, £250 should come off the £2864. This might be more than was actually taken; but if £225 were, Mr. Millar's maintainable profit would be £2639 18s. 10d. The mean of the three would then be £2656 12s. 1d.; and the mean of that sum and of the £2861 12s. 5d. would be £2729 2s. 3d. Now, if 23 years' purchase were taken, the figure would work out at £62,769 11s. 9d., which is very little different from that which the Sheriff arrived at. This is a fancy calculation; but it is somewhat interesting. So far as I can learn, there is a general acquiescence in the award. It is true that the increase upon Mr. M'Gilchrist's figure of £1567 10s. 11d., which the Sheriff has made, trifling though it be, is being used by those who oppose the transfer, as showing that the valuation was not a reliable one; and they are to appear before a Parliamentary Committee with some such argument. But the facts are not there to support any contention of the kind. The truth is that the award brings out, with remarkable force, how very skilfully Mr. M'Gilchrist must have gone to work in making his valuation. The opposition are, however, a feeble folk; and I suspect they will not make very much of a show before Parliament. They have £60 to spend upon their venture—a sum which will not go very far before a parliamentary tribunal. I hear that the petition of the objectors, on being scrutinized, discloses serious irregularities, such as the signing of it more than once—which will take away from its weight. Now that the award is out, there is abundance of time, even though objections should be lodged to it, to have them all disposed of before the Parliamentary Committee reach the Corporation Bill.*

The Town Council of Glasgow resolved on Thursday to separate the electric lighting from the gas department. Mr. D. M. Stevenson, who brought the subject forward, proposed that the change should be made at the end of the current financial year—the 31st of May; but the Council, in agreeing unanimously to the motion, decided that the change should be made at once, and that the Electric Lighting Committee should be appointed that day fortnight. Mr. Stevenson, in support of his motion, said he had no intention to criticize hostilely the action of the Gas Committee. Quite the contrary. They were much indebted to the Gas Committee for having carried the thing so far; but the time had come when there should be a separation. There was no doubt that the electric lighting had suffered from being more or less dependent on the other. Well, that is arrant nonsense, because the Gas Committee have more than once made up deficits which have been incurred in the electric lighting department; and if this department is now paying its way, as it is said to be, the testimony is rather to successful management than to either the neglect of, or the infliction of suffering upon it. Mr. R. M. Mitchell, the Convener of the Gas and Electric Lighting Committee, said he did not oppose the motion; but he would not like it to go out that the works in Glasgow were in any way inferior to those to be found elsewhere. As a matter of fact, they were among the most complete in the United Kingdom. He hoped that, now an arrangement had been come to for the alteration of the present plant, which had not been altogether what it might be, a great extension of street lighting would take place. He must say, in fairness to the Gas Committee and the officials, that the Electric Lighting Committee had benefited greatly by the counsel and advice which had been given most disinterestedly. As regarded the financial aspect of the question, he thought he was right in saying that it lay with the Gas Trustees, as the local authority on lighting, to appoint whatever Committee they liked; and they were also to be responsible for the working out of the electric lighting. The Committee which would deal with the electric light, would consist of the present members of the Electric Lighting Sub-Committee, along with the members whom the Council might elect to act with them.

* We give in another column the first portion of our report of the proceedings in the arbitration; the case for the Corporation being held over till next week.—Ed. J.G.L.

The borrowing powers at their disposal were almost exhausted. In the near future, a large gas-works must be erected in order to keep pace with the extraordinary demand for gas, which, instead of being lessened by the electric light, had been greatly extended; and arrangements would have to be made whereby power to borrow the necessary money for this and the new electric light plant would be obtained in the next session of Parliament. So far as he was concerned, he had to admit that the Chairman of the Gas Committee had quite sufficient work; and he only hoped that in the future the Electric Light Committee, with the new members to be added to it, would have as successful a career as the Gas Committee had enjoyed. Bailie Fife brought forward an idea which shows that, however easy it may be to talk of reforms, it is not always so easy to accomplish them. He thought there was a danger of the finances of the Gas Committee being disarranged by this proposal. They fixed the price of gas as near as possible at the cost at which it would be produced; and if the Electric Lighting Committee created a deficit of £5000 or £10,000 in the extension of the system, they would upset their financial arrangements. The Clerk, too, referred to the same subject, and pointed out that the funds of the gas department would still be liable for any losses which might arise on electric lighting.

The gas accounts of the Glasgow Corporation are coming out very well. In the period of the financial year till Feb. 24, the amount of gas-rent collected amounted to £248,174—an increase of £428 upon the corresponding period of last year. This is quite a good result, when it is considered that the price of gas is 2d. per 1000 cubic feet lower than it was last year. The sales of residual products in the same period have realized £79,909—a decrease of £428. The one therefore balances the other. In the same period, electric light rents have amounted to £16,082, which is an increase of £3558.

The employees in the Tradeston gas-works of the Glasgow Corporation held their annual concert on Thursday night. Bailie Fife, who presided, said that during the winter between 2500 and 3000 persons were engaged in the gas and electric light departments. The operations connected with such an important trust were of no mean order, as the works had developed in a marvellous way. It was 80 years since gas was introduced into Glasgow; and 30 years ago the works were taken over by the Corporation. In connection with the Tradeston works, the increase had been of a decided character. Ten years ago they employed 340 men during the winter at this branch; they used 71,000 tons of coal; and made 664,000,000 cubic feet of gas. In the year 1895-96, they employed 620 men; they used 154,000 tons of coal; and they turned out 1,401,000,000 cubic feet of gas. Their wages bill ten years ago was £16,369; whereas during the past year, it was £30,866. The relations between employers and employed had always been amicable; and during the six years he had been connected with the department, he could not remember a single unpleasant incident. Though the entertainment is described as an annual one, it is said to be twelve years since the last was held.

What are characterized as "wild rumours" have been circulated regarding the condition of the tank of the new wire-rope guided gasholder at Falkirk. They were referred to at a meeting of the Gas Commission on Tuesday, by Bailie Hamilton, who was able to explain them. It appears that all that the rumours are founded upon is that the tank has sunk 4½ inches at one side. Bailie Hamilton said the stories being told about the matter were perfectly terrifying. As a matter of fact, the holder had been working all the winter without any hindrance whatever. The Contractors were to send down men, who were "to level it from the top, and put a belt round it, to make it proper"—whatever that may mean. There is satisfaction in learning that this is all that is wrong. In this case, as in that of Middlesbrough, it is not the wire-rope system that has given trouble, but the foundation. It is useless to speculate upon what would have been the result had the holder been enclosed in guide-framing, for the conditions would then not have been the same. Where guide-framing is adopted, whether there be a metallic tank or a built one, the pillars must be supported on masonry; and for this, according to universal practice, a sound foundation must be found, no matter at what depth. There seems to have been a belief that where a steel tank was used, its great breadth would prevent it from sinking, and consequently less attention was necessary to the foundation. Experience at Middlesbrough and Falkirk, points to the necessity for seeing that the foundation is stable. The Falkirk holder stands upon a site which, while it cannot be called marshy, is soft, and, I believe, variable as to the nature of the soil composing it; and the tank is more than two-thirds above the surface of the ground. It will scarcely do to repeat these conditions, though it might cost a little more to put in a foundation. I point this out because the wire-rope system is a great success in the matter of working; and it must not be confounded with any defects which may have arisen in connection with foundations.

The Edinburgh Corporation Bill passed the Committee of the House of Commons yesterday as an unopposed measure, and was ordered to be reported for third reading.

The Forfar Gas Corporation, having obtained their much spoken of photometer, this week received the first report submitted by the examiner whom they have appointed. It was to the effect that the lowest illuminating power was 22·4 candles; the highest, 27·6 candles; and the average, 23·8 candles. The gas consumption during the past month showed an increase of 19,900 cubic feet as compared with the corresponding period of last year.

A dispute of long standing between the Edinburgh and District Water Trust and the Clippens Oil Company is likely to come to a head. Cross applications for interdict have been presented in the Court of Session. The matter has reference to the support which the Water Trust's mains are entitled to as they pass through the lands of Pentland and Straiton, where the Clippens Company's works are. The Company have requested the Trustees to purchase a strip of minerals under, and extending to 40 yards on each side of, the Trustees' pipe-track; and the Trustees, to avoid purchase, have, it is said, begun to lay a substitute pipe-track along a public road. This the Company wish to have interdicted, on the plea that the Trustees have no statutory authority to do such a thing, and that the operations of the Trustees would interfere with and damage the communications between their works, which are on both sides of the road. The Trustees seek to interdict the Company from working out the minerals. Lord Pearson has granted interim interdict against the Company, and sent both cases for trial. In the case against the Trustees, he has allowed them to proceed, on their giving an undertaking that they will not interfere with the Company's rights under the road, and that their work will be done to the satisfaction of Mr. Charles Stevenson, of Edinburgh.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 20.

Sulphate of Ammonia.—Throughout the week, a quiet tone has pervaded the market, and values have been barely maintained—the closing quotation being £8 3s. 9d. per ton, delivered f.o.b. at the ports. There has been more stuff offering than was the case in the early part of the month, though there has not been any pressure on the part of makers to sell. On the other hand, direct export orders have been scarce; there being still second-hand sellers for the Continent at below the equivalents of United Kingdom quotations. Dealers continue for the most to hold aloof; only pressing orders being covered. The most satisfactory feature has been the sustained demand for home consumption absorbing a large portion of the smaller makes. The home demand in Scotland has also shown a marked increase upon that of previous years. The forward position remains very much as last reported; buyers evincing very little interest in it.

Nitrate of Soda is quiet, but fairly steady on spot, at 8s. 1¼d. per cwt. for good up to 8s. 3d. per cwt. for fine quality. Owing to arrivals at port of call, cargoes are more difficult to dispose of, and the closing value is 7s. 10½d. to 7s. 11d. per cwt.

LONDON, *March* 20.

Tar Products.—More business is doing in pitch; and there are now buyers for next season's delivery. It looks as if pitch will not now go lower. Indeed, the tendency at the moment is to somewhat higher prices, though the quantity produced seems to be amply sufficient for requirements. Benzols are lower. A determined effort on the part of some dealers to depress benzol is very apparent. Very little business has been done; but market prices have been put down seriously during the week. There are no stocks of benzol either at home or abroad; and the aniline trade is distinctly good, with an ever-increasing output. There is no reason why benzol should be cheaper. Carbolic acid is fairly firm; and crystals are scarce. Anthracene is quiet; and prices are nominal. It is reported that the tar distillers, who paid high prices for tar, are now suffering seriously from the fall in products.

Market quotations to-day are: Tar, 15s. to 21s. Pitch, 21s. to 23s. 6d. Benzols, 90's, 2s. 6d.; 50's, 2s. 3d. Toluol, 2s. Solvent naphtha, 1s. 7d.; crude, 30 per cent. naphtha, 11½d. Creosote, 1¼d.; liquid, 1⅜d. Heavy oils, 37s. 6d. Carbolic acid, 2s. 3d. Naphthalene, 57s. 6d.; drained salts, 25s. Anthracene, "A," 8½d.; "B," 7½d.

Sulphate of Ammonia is in an anomalous position; but, notwithstanding shipments being enormous (largely in excess of last year, which were also in excess of the previous year), the value during the week has fallen. The position is doubtless due to dealers, having booked forward business, now endeavouring to buy at low prices. A much larger home trade is springing up, the effect of which should make itself felt on the value of sulphate for shipment. Prices at various ports may be taken as £7 17s. 6d. to £8 2s. 6d., less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—If anything, there has been rather more business doing in the better qualities of round coal during the past week; and most of the pits are kept on pretty nearly full time. Prices are without alteration, beyond the slight easing down here and there noted last week. At the pit mouth, best Wigan Arley averages 10s. to 10s. 6d. per ton; and Pemberton four-feet and seconds Arley, 8s. to 8s. 6d. Steam and forge coals meet with a fair demand; but supplies are ample, and prices rather weak—5s. 9d. to 6s. per ton representing about the average at the pit. Engine fuel is also generally plentiful; considerable stocks accumulating at some of the collieries. Others, however, are readily disposing of their present output; and prices are steady at about 3s. to 3s. 6d. per ton for common, and 4s. 6d. to 4s. 9d. for best sorts. In the shipping trade, there is only a slow business doing; and orders are competed for at low figures—7s. 6d. to 7s. 9d. per ton being the full average prices obtainable for ordinary steam coal, delivered at the Garston Docks, or the High Level, Liverpool.

Northern Coal Trade.—There is now an increased demand for coal for export; but it is concurrent with a lessened business in both household and gas coal for home consumption, so that the effect is merely to throw trade from one class of collieries to another. A large number of contracts for coal are also under negotiation; but there is as yet little definitely settled. It is expected that, as the result of the tenders that have been sent in, there will be the gaining of the Rotterdam gas coal contract this year by the Durham collieries for at least two-thirds of the total, and that the remainder will probably be sent to German pits. The price is thought to be a trifle higher than last year. Best Northumbrian steam coals are steady at 8s. per ton f.o.b. for prompt delivery; second qualities are 7s. 6d. per ton; and steam smalls, 3s. 3d. to 3s. 6d. For manufacturing coals, there is no change in the price; but the possibility of an engineering strike makes the market very dull. The gas coal trade is very firm for the time of year; and the price is well maintained. The shipments of gas coals have been exceedingly heavy for the last few days; and there is the idea that some gas coal users are stocking more freely, lest there should be a renewal of the railway strike next month. Best Durham gas coals are steady at from 6s. 9d. to 7s. 3d. per ton f.o.b. Gas coke is unaltered; but the stocks are heavy at some inland works.

Scotch Coal Trade.—Steady trade is reported from all the districts. The improving condition of business is to be seen in the granting of advances in wages to the miners in the Lothians and Fife. Trade is also expected to benefit by the reduction to 2d. per ton, which has been effected in the harbour dues upon coal shipped in the Clyde. With all these to be taken into account, there need be no surprise at the fact that the forward demand is improving. Prices for nearly all sorts as yet remain steady. The quotations are: Main, 6s. 6d. to 6s. 9d. per ton

f.o.b. Glasgow; ell, 7s.; and splint, 7s. to 7s. 3d. The shipments for the week amounted to 120,124 tons—a decrease of 10,408 tons on the preceding week, but an increase of 18,855 tons over the corresponding week of last year. For the year to date, the shipments have been 1,276,840 tons—an increase upon the corresponding period of last year of 75,002 tons.

The New Carbonizing Plant at the Longton Gas-Works.—In the paragraph on this subject which appeared in the "JOURNAL" last week (p. 591), it should have been stated that the plans were prepared by Mr. W. S. M'Gregor, Gas Engineer and Secretary of the Longton Corporation.

Cowes Gas Company.—At the recent annual meeting of this Company, the Directors reported a balance of £2229 on the profit and loss account, out of which they recommended the declaration of a dividend at the rate of 4½ per cent.; making with the interim dividend paid in June 8½ per cent. for the year—this being the amount to which the proprietors are entitled under the sliding-scale, as the price of gas is 1d. per 1000 cubic feet below the standard. There has been a considerable accession of customers, and a consequent increase in the consumption of gas; and the erection of a new holder has been necessitated.

Lamplighters' Wages at Oldham.—As reported in last week's issue, the Gas Committee of the Oldham Corporation lately granted the lamplighters an increase in their wages of 1s. per week, with twelve days' holiday a year. The Gas-Works Superintendent (Mr. A. Andrew) has since reported that the twelve days' holiday a year would cause considerable inconvenience to the department; and he suggested that, in lieu of the concession already made, the men should be paid 6d. per hour, and have no fixed holiday allowance. The men have expressed themselves favourable to this proposition; and, consequently, the Committee have rescinded their resolution, and substituted Mr. Andrew's proposal.

Wrexham Gas Company.—At the annual meeting of this Company it was reported that there had been an increase in all the items of receipts as compared with the previous year; the amount received for gas supplied being £9472, as against £9329 in 1895, notwithstanding a reduced expenditure for coal and cannel. Referring to this satisfactory condition of affairs, the Chairman (Mr. J. O. Bury) said it was very gratifying to know there had been an increase in each of the items of receipts, and notably from the sale of the residuals, which for the year amounted to £1644, as against £1532 in the preceding year. Regarding the troublesome question of the leakage of gas, he stated that it had been considerably diminished. In 1894, it was equal to 14·89 per cent.; in 1895, to 9·32 per cent.; and it had been still further reduced in 1896 to 8·38 per cent. They believed they had now brought it down to its minimum. Regarding the works, the Directors had had under consideration the desirability of adopting the system of regenerative retort-settings; and if they found it practicable to adopt it, he thought there could be no doubt that by the next annual meeting the Directors would be in a position to announce the possibility of reducing the price of gas. The report was adopted; and dividends of 5 per cent. on the consolidated stock and 3½ per cent. on the shares—making 10 and 7 per cent. respectively—were declared.

Incandescent Gas Lighting at Deal.—The Deal Town Council have entered into an agreement with the Gas Company for lighting the Marina and some of the principal thoroughfares for three years. The Council are to pay the same price per lamp as heretofore—viz., £3 10s. 6d.

Extensions at the Oswaldtwistle Gas-Works.—At the last monthly meeting of the Oswaldtwistle District Council, the Clerk (Mr. W. Sandeman) explained that the borrowing powers under their Gas Act had expired, with the exception of £1661. It was therefore necessary that application should be made for further powers, especially in view of a contemplated extension of the gas-mains, the provision of additional storage for the gas manufactured, and new plant. A resolution was adopted to the effect that application should be made for authority to borrow £5000.

Reductions in Price.—The Directors of the Caterham and District Gas Company have decided to reduce the price of gas 3d. per 1000 cubic feet as from the 25th inst.; bringing it down to 4s. This is a reduction of 9d. in two years. The Company have adopted the system of charging at a lower rate for all "extra gas" consumed; the rate being 3s. 6d. per 1000 cubic feet. This will not be affected by the reduction about to come into force. After the 25th inst., the price of gas supplied by the Windermere Gas and Water Company will be reduced to 4s. 6d. per 1000 cubic feet for quantities less than 10,000 cubic feet per quarter, 4s. 3d. for any amount between this and 20,000 feet, 4s. up to 40,000 feet, and 3s. 9d. beyond this figure—the charge for gas used for cooking, heating, and motive power being 3s. 4d. per 1000 feet—all subject to 5 per cent. discount for prompt payment. Meter-rents have been reduced to the extent of 6d., 7d., and 1s. per quarter, according to size.

Sales of Stocks and Shares.—The following transactions in stocks and shares have lately taken place: A parcel of £5000 of consolidated "B" stock, paying 11 per cent., of the Croydon Gas Company was disposed of at an average price of £277 3s. 3d. per cent. This is greatly in excess of the prices obtained at a sale a few weeks ago, when £256 per cent. was obtained. The amount realized for the £5000 of stock was £13,858. At Ipswich, last Tuesday, £2500 of new "C" stock of the Ipswich Gas Company (with dividend accruing from Jan. 1) was offered to public competition. The shares of £10 each, the dividend on which is now at the rate of 9 per cent. per annum, fetched £23 and £23 2s. 6d. each; the total amount obtained being £5773 15s. When this class of stock was sold in 1893 and 1894 (the dividend then being 8½ per cent.), the average prices were £18 15s. 4d. and £18 6s. 2d. respectively. Last Friday, about £950 of "D" stock of the Tonbridge Gas Company, paying 8½ per cent., was offered for public competition. There were 18 lots of £50 each, and one odd lot; but as 17 lots realized £1616, and £1610 was the amount the Company were authorized to raise, the last two were withdrawn. Of the 17 lots disposed of, seven sold at £94, three at £95, six at £96, and one at £97 per lot. Last Thursday, £16,000 of 4 per cent. preference stock in the Fylde Water Company was offered for sale by Messrs. Dewhurst, of Preston. The first few lots were disposed of for £144 each; and then the price dropped to £140, at which most of the stock changed hands. The last seven lots realized £141; and the average was £141 11s. 5d. per £100. £10 of "B" stock, bearing 7 per cent., in the same Company, was sold for £22 10s.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 644).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	24–26	..	4 0 9
100,000	10	,,	7½	Do. 7 p. c.	17½–18½	..	4 1 1
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	108–111	..	4 10 11
200,000	10	29 Oct.	5	Belgrano (B. Ayres), Limited	9½–10	..	5 0 0
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	102–105	..	4 15 3
200,000	5	12 Nov.	6½	Bombay, Limited	6½–7½	..	4 6 8
40,000	5	,,	6½	Do. New, £4 paid	5–6	..	4 6 8
380,000	Stck.	26 Feb.	12	Brentford Consolidated	285–293	..	4 2 9
240,000	,,	,,	9	Do. New	223–228	..	3 18 7
50,000	,,	,,	5	Do. 5 p. c. Pref.	138–143	..	3 9 11
159,375	,,	11 Dec.	4	Do. 4 p. c. Deb. Stock.	130–134	..	2 19 9
220,000	Stck.	16 Sept.	11½	Brighton & Hove Original	272–277	+2	4 3 0
208,820	,,	,,	8½	Do. A Ord. Stk.	198–203	..	4 3 9
933,500	Stck.	26 Feb.	5	Bristol, 5 p.c. max.	128–133	..	3 15 2
420,000	20	15 Oct.	11½	British	57–58	..	3 17 7
50,000	10	26 Feb.	11½	Bromley, Ordinary 10 p. c.	23–25	..	4 12 0
71,000	10	,,	8½	Do. 7 p. c.	18–20	..	4 5 0
500,000	10	15 Oct.	6	Buenos Ayres (New) Limited	9½–10½	..	5 14 3
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	101–103	..	5 16 6
150,000	20	26 Feb.	8½	Cagliari, Limited	29–31	..	5 6 5
100,000	10	30 Sept.	6	Cape Town & District, Ltd.	15½–16½	..	3 12 9
50,000	50	3 Nov.	6	Do. 6 p. c. 1st Mort.	57–59	..	5 1 8
550,000	Stck.	15 Oct.	13½	Commercial Old Stock	344–349	+6	3 17 4
165,000	,,	,,	10½	Do. New do.	255–260	..	4 0 9
165,000	,,	11 Dec.	4½	Do. 4½ p. c. Deb. do.	150–155	..	2 18 0
800,000	Stck.	30 Dec.	13	Continental Union, Limited.	260–265	..	4 18 1
200,000	,,	,,	10	Do. 7 p. c. Pref.	215–220	..	4 10 11
51,600	Stck.	26 Feb.	14	Croydon Com'cial A 10 p. c.	315–320	..	4 7 6
163,400	,,	,,	11	Do. B 7 p. c.	250–255	..	4 6 3
535,000	Stck.	26 Feb.	5½	Crystal Palace Ord. 5 p.c. Stk	140–144	..	3 12 11
60,000	,,	,,	5	Do. 5 p. c. Pref.	140–143	..	3 9 11
486,090	10	29 Jan.	11	European, Limited	25–26	..	4 4 7
354,960	10	,,	11	Do. £7 10s. paid	17½–18½	..	4 9 3
5,896,590	Stck.	12 Feb.	12¾	Gaslight & Coke, A, Ordinary	311–316	−1	4 0 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	110–114	+1½	3 10 2
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	307–312	..	3 4 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	145–150	..	3 6 8
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	210–215	..	3 9 9
300,000	,,	,,	7	Do. H, 7 p. c. max.	207–212	..	3 6 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	307–312	..	3 4 1
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	177–182	..	3 5 11
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	137–142	..	2 16 4
294,850	,,	,,	4½	Do. 4½ p. c. do.	150–155	..	2 18 1
908,000	,,	,,	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	29 Oct.	6	Hongkong & China, Limited	12–13	..	4 12 4
3,800,000	Stck.	12 Nov.	12	Imperial Continental	212–217	..	5 10 7
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	99–102	..	3 18 5
473,600	Stck.	12 Feb.	3½	Do. 3½ p. c. Deb. Stk	104–107	..	3 5 5
75,000	5	11 Dec.	6	Malta & Mediterranean, Ltd.	5½–6½	..	4 16 2
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	113–115	+1	4 6 11
250,000	100	,,	4½	Do. 4½ p. c. Debs.	109–111	..	4 1 1
541,920	20	12 Nov.	5	Monte Video, Limited	15–16	−½	6 5 0
150,000	5	26 Nov.	8	Oriental, Limited	8½–9	..	4 8 11
135,000	5	,,	8	Do. New, £4 10s. paid	7½–8	..	4 10 0
15,000	5	,,	8	Do. do. 1879, £1 paid	1½–2	..	4 0 0
60,000	5	16 Sept.	7	Ottoman, Limited	5–5½	..	6 7 3
420,000	100	2 Nov.	6	People's Gas } 1st Mtg. Bds.	100–105	..	5 14 3
500,000	100	1 Dec.	6	of Chicago } 2nd Do.	100–105	..	5 14 3
250,000	10	30 Sept.	10	San Paulo, Limited	13½–14½	+½	6 18 0
5,475,000	Stck.	26 Feb.	5½	South Metrop., 4 p.c. Ord.	144–147	−1	3 11 5
850,000	,,	14 Jan.	5	Do. 5 p. c. Deb. Stk.	173–177	..	2 16 6
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	275–285*	..	4 0 10
60,900	,,	,,	8½	Do. B	190–200*	..	4 5 0
182,380	10	30 Dec.	10	Tuscan, Limited	14–15	..	6 13 4
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	101–103	..	4 17 1
				WATER COMPANIES.			
746,159	Stck.	30 Dec.	10½	Chelsea, Ordinary	333–338	..	3 2 2
150,000	,,	,,	5	Do. 5 p. c. Pref.	175–180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	158–162	..	2 15 6
175,785	,,	30 Sept.	4½	Do. 4½ p. c. Deb. Stock	162–167	..	2 13 11
1,720,560	Stck.	15 Oct.	7	East London, Ordinary	225–230	−2	3 0 10
654,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	162–167	..	2 13 11
225,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	106–108	..	2 15 7
700,000	50	11 Dec.	7½	Grand Junction, 10 p.c. max.	113–118	..	3 3 6
295,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150–155	..	2 11 7
708,000	Stck.	12 Feb.	12	Kent	340–345	..	3 9 7
160,000	,,	,,	7	Do. New, 7 p. c. max.	212–217	..	3 4 6
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	273–278	..	3 8 4
406,200	100	,,	7½	Do. 7½ p. c. max.	222–227	..	3 6 1
350,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150–153	..	2 12 3
500,000	100	12 Feb.	13	New River, New Shares	420–425	+2	3 1 1
1,000,000	Stck.	29 Jan.	4	Do. 4 p. c. Deb. Stk.	152–155	..	2 11 7
902,300	Stck.	30 Dec.	6	S'thwk & V'xhall, Ordinary	157–162	..	3 14 1
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	150–155	..	3 17 5
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	175–180	..	2 15 7
1,019,585	,,	30 Sept.	4	Do. 4 p. c. A Deb. Stk.	147–150	..	2 13 4
1,155,066	Stck.	11 Dec.	10	West Middlesex	310–315	..	3 3 6
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	163–168	..	2 13 7

*Ex div.

The Leeds Gas Committee and Gas-Stoves on Hire.—The Works Sub-Committee of the Gas Committee of the Leeds Corporation have recommended the supply of gas cooking-stoves which have been in use upwards of ten years at a greatly reduced price, or at a lower rental. It is considered that the rent received for a stove during ten years pays the initial cost, with interest.

New Joint-Stock Companies.—The Crowborough Gas Company has been registered with a capital of £10,000, in 50 founders' shares of £1 each and 1990 ordinary £5 shares, to supply gas and other illuminants in the parish of Rotherfield, Sussex, and the neighbourhood. The Midland Acetylene (Parent) Syndicate, with a capital of £50,000, in £1 shares, has been founded to establish and assist in establishing companies, associations, and syndicates for the manufacture and exploitation of calcium carbide, and to manufacture, sell, and deal in carbides which generate inflammable gas, acetylene, and other gas, benzene, &c.

Windsor Gaslight Company.—At the half-yearly meeting of this Company, the Directors reported that they had reduced the price of gas by 2d. per 1000 cubic feet—viz., from 3s. 6d. to 3s. 4d.—as from Jan. 1 last, which represented a loss of income of £642 per annum. Before the Company was incorporated in 1867, the charge was 5s. 6d. per 1000 cubic feet, since which time nine reductions have been made—viz., 1867, 5s. 6d. to 5s.; 1876, 5s. to 4s. 9d.; 1877, 4s. 9d. to 4s. 6d.; 1881, 4s. 6d. to 4s. 3d.; 1883, 4s. 3d. to 4s.; 1898, 4s. to 3s. 10d.; 1892, 3s. 10d. to 3s. 8d.; 1895, 3s. 8d. to 3s. 6d.; 1897, 3s. 6d. to 3s. 4d. The profit and loss account for the half year showed that the receipts were £9516. This included £7112 from private consumers; £376 17s. 10d. for public lighting; £233 in meter and stove rental; and £1366 from residual products. The expenses amounted to £7164; leaving as net profit £2351, which was £439 more than at the close of the corresponding half of 1895. The capital of the Company is £53,200. The report was adopted, and the usual maximum dividends declared.

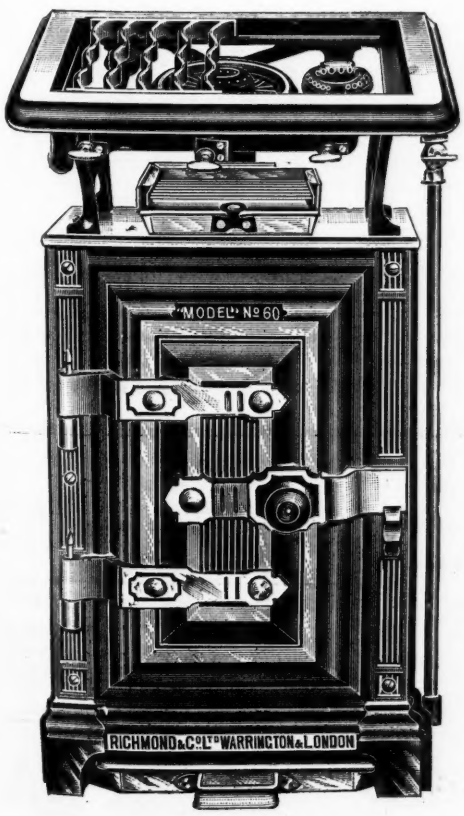
Proposed Extension of Salcombe Gas-Works.—In consequence of the increasing demand for gas, the Directors of the Salcombe Gas Company have had under consideration the question of carrying out some extensions. They have purchased a plot of land adjoining the present works; and at the recent annual meeting of the Company, the Chairman (Mr. J. S. Hurrell) explained that it was absolutely necessary that something should be done to keep pace with the growing requirements of the town. The business had outgrown the plant; and they were not now producing gas in the most economical way. On some days they made more than the holder would contain; and in enlarging the works, they must provide storage for a couple or four days' supply. He also thought the Company should lay themselves out to meet the requirements of consumers in regard to gas-stoves and prepayment meters. In reference to the present position of the Company and the raising of capital for the proposed extension, he explained that the profit of the past year was equal to 7 per cent. on the present capital, and was the largest they had made. They had, however, for years paid 5 per cent. It had not yet been decided whether they should borrow the additional money required, or issue new shares for a large portion of it and borrow the remainder.

The Assessment of the Cardiff Water-Works.—The Cardiff Corporation Water Committee appealed against the new assessment of their works, and secured a reduction of above £4000, which will make a difference in favour of the Corporation of nearly £1300 per annum.

The Proposed New Reservoir for Cape Town.—A poll of the ratepayers of Cape Town has rejected the proposal of the municipal authorities to raise a loan of £112,000 for the purpose of constructing a new reservoir on Table Mountain, in accordance with the scheme of Mr. T. Stewart, described in the JOURNAL on the 23rd ult. (p. 428). The majority against the scheme was only 15 on a poll which is said to represent only about one-tenth of the ratepayers. It is suggested that the popular objection is not to more water, but rather to the increased storage of water on Table Mountain; and it is thought that the next step should be to ascertain what are the other available sources of water supply.

The Water Supply of Belper.—Mr. F. B. Tulloch, one of the Inspectors of the Local Government Board, held an inquiry at Belper last Wednesday respecting an application by the District Council for sanction to the borrowing of £8400 required for laying new pipes in the town. The Inspector was informed that the late Mr. George H. Strutt advanced all the money to buy out the old Water Company, free of interest. Subsequently his son, Mr. Herbert Strutt, cancelled the mortgage deed, thereby constituting a free gift of the whole of the works to the inhabitants. Since then the latter gentleman had allowed trial bore-holes to be made on his land, and a well had been sunk. Besides this Mr. Strutt had undertaken to erect the pumping works, engines, boilers, and machinery, and lay the mains to his boundary. He had also purchased a site at the highest elevation in the town, on which to build a reservoir, besides granting easements over his estates. The Inspector said he could understand there could be no opposition under such circumstances, as the town would acquire the most complete works at a nominal cost through the gifts of the gentlemen named.

The Chester Gas Company and the Public Lighting of the City.—The Watch Sub-Committee laid before the Chester Town Council last Wednesday a report dealing with negotiations which had been proceeding between them and the Gas Company for further public lighting. It stated that, prior to the introduction of the electric light, the Corporation had 802 lamps burning 4 cubic feet of gas per hour, at a total cost of £1951 10s. 8d. per annum. The Corporation had decided not to continue the lighting of 24 of the small lamps; thus leaving 778. Though there was this reduction, the Company's proposal was to continue the lighting at a cost of £228 9s. 4d. more than was charged when the 802 small lamps were used last year. In the discussion upon the report, Alderman Churton said the only remedy the Corporation had was to lay the electric light mains throughout the whole of the streets of the city. Mr. Jones thought the Council ought to pass a vote of thanks to the Gas Company, because, by their action, they had improved the prospects of the Corporation in regard to the supply of the electric light. Their electric lighting was a great success; and a large number of persons were taking steps to adopt it. Dr. Elliot suggested that the Council should consider the advisability of replacing the street gas-lamps by electric lights. The proceedings of the Committee were adopted.



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Opening of the New Reservoir at the Farnham Water-Works.—The new works and reservoir of the Farnham Water Company were formally opened on Monday afternoon last week, when Mr. G. M'Donald, the Chairman of the Company, turned on the first supply to the town from the Gravel Hill works. At the general wish of those present, the new reservoir was named the "Victoria."

The Colne Corporation and the Keighley Water Rights.—At the meeting of the Keighley Town Council last Tuesday, Alderman Brigg made a statement as to the powers the Colne Corporation were seeking in their Bill now before Parliament, and which involved a considerable encroachment upon the gathering-ground secured by Keighley. The Committee had already placed their views before the Colne Corporation; and though the latter had shown some disposition to alter the Bill, they had not, he was sorry to say, been willing to accept the clause which the Committee were of opinion could alone protect their rights. The Committee had visited the gathering-ground of the Watersheddles reservoir, and found that the encroachment by Colne would be at least 100 acres. This ground appeared to be one huge sponge, from which water would percolate into the reservoir. It was therefore exceedingly undesirable that this valuable ground should be lost; and the Committee were of opinion that nothing would be satisfactory to the Council short of the acceptance by Colne of a clause safeguarding all Keighley's rights. He believed the Council would support the Committee in their view that the opposition of Keighley to the Colne Bill should change from a passive to an active form; and he therefore moved that the necessary steps be taken by the Town Clerk to protect their water rights. This was unanimously agreed to.

Water Divining in South Devon.—Considerable difficulty has been experienced in providing a water supply for the parish of Kings Kerswell, in South Devon. Various schemes have been proposed; but all have been rejected, either because they did not promise to furnish an adequate and reliable supply, or because, like the idea of obtaining water from Torquay, they were too costly. Recently it was suggested that the District Council should engage the services of Mr. Leicester Gataker, a water diviner of Weston-super-Mare, who was said to have made several successful finds in the neighbourhood. Mr. Gataker recently visited the village. He was accompanied in his search by the Chairman of the Parish Council, two District Councillors, the Surveyor (Mr. Segar), and several amateur diviners. Most of the latter employed the hazel twig, and one a piece of wire. Mr. Gataker used neither. With his hand held out, he walked over the land; and when he approached a spring, he became visibly agitated, and followed the course of the water at the pace at which it was flowing. He indicated several places in which he said an ample supply of water would be found; one being not far from an experimental boring made some months ago. The most likely spot is close to the village, where Mr. Gataker estimated that water would be found within 100 feet of the surface, and that the yield would be 20,000 gallons a day.

Among the receipts at the offices of the Prince of Wales's Hospital Fund for London, at the Bank of England, last Tuesday, was an annual subscription of £100 and a donation of £400 from the Incandescent Gas-Light Company, Limited.

In connection with the projected extension of Messrs. Fletcher, Russell, and Co.'s Warrington works, to which reference was made in the "JOURNAL" for the 23rd ult., it may be mentioned that 12 acres of land adjoining the Warrington football ground have been secured from Messrs. Greenall, Whitley, and Co. Messrs. Fletcher, Russell, and Co. were anxious to obtain possession of the ground occupied by the Football Club, and they offered to give the club £200 in cash as compensation, and take the fences at a valuation; while Messrs. Greenall, Whitley, and Co. offered the club £150 additional compensation, and the use of an adjoining field at the same rent. The club, however, declined these offers, with the result that Messrs. Fletcher, Russell, and Co. have secured the adjacent 12 acres, and the club have received notice from Messrs. Greenall, Whitley, and Co. to terminate their tenancy of the ground they now occupy.

GWYNNE & BEALE'S
PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095.

GWYNNE & CO.,
HYDRAULIC AND GAS ENGINEERS,
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

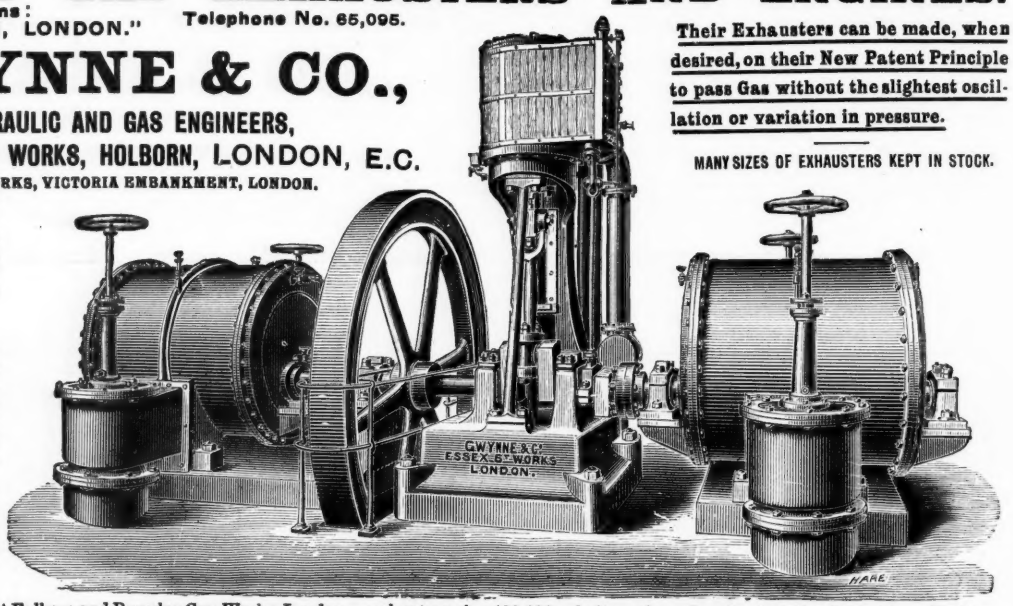
They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.



Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. in use in most Continental Gas-Works, and in more than 300 British Gas-Works.

ANDREW STEPHENSON, 182, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.

Telegrams: "Volcanism, London."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

[For Illustrated Advertisement, see March 2, p. 498.]

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. Sample and Price on application.

OXIDE PAINTS, OILS, SULPHURIC ACID, &c. 120 and 121, NEWGATE STREET, LONDON, E.C.

Telegrams: "BOGORE, LONDON."

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.

Before placing Orders, please write for Estimate.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application.

70, CHANCERY LANE, LONDON, W.C.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND Co., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR wanted.
BROTHERTON AND Co., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE wanted.
BROTHERTON AND Co., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.
BROTHERTON AND Co., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

TUBES for Gas, Steam, and Water (all Sizes), Welded or Riveted. TANKS, HYDRAULIC MAINS, RETORT-LIDS, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See p. 620, last week's issue.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

WANTED, a Situation as Gas-Fitter.
Experienced in Stove Fixing and Repairing.
Address No. 2820, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

STEADY Man wants job as Stoker. Used to Engine and Exhauster, and Scoop or Shovel Charging. Good References. Age 29.
Address W. BUDD, 68, Morley Road, Barking, ESSEX.

RE-ENGAGEMENT wanted by a very successful GAS AND WATER ENGINEER and MANAGER. Recently resigned good position. Well known in the Profession. Desires to travel for a good Firm. Correspondence invited.
Address No. 2816, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, at a small Country Works, a GAS STOKER who will make himself generally useful. Constant Employment.
Apply to the MANAGER, Gas-Works, West Malling, KENT.

WANTED, a Working Manager of Gas-Works. Must have a knowledge of Fitting. Single-handed eight or nine months in the year.
Apply, stating Age and Salary required, to the SECRETARY, Gas Company, Olney, BUCKS.

MANAGER wanted for Country Gas-Works, where Generators, Exhaust Engine, Scrubber, and Washer are used. Must be a good Fitter, and thoroughly understand the Manufacture of Gas. House, Coal, and Gas found.
Apply, by letter, stating full Particulars and Wages required, to Mr. F. L. THOMPSON, Gas Office, Solihull, near BIRMINGHAM.

WANTED, 30 miles North of London, on the erection of a Gas-Works of 250,000 Cubic Feet per diem capacity, an INSPECTOR and CLERK of WORKS competent to make any little Details as the work proceeds. Preference given to a Man who has had experience in this work and in starting new Gas Plant at Work. The Buildings are already nearly roof high. First-class (recent) Testimonials and References required. State Age, and Salary required per week.
Apply to No. 2819, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MALVERN URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT).

FITTER.

WANTED, immediately, a good reliable WORKMAN as above. One thoroughly accustomed to all Plant in Gas-Works, and who can take the lead in alterations. Permanent Employment for a really good Man.
Apply, giving References and Wages required, to
H. P. MAYBURY,
Gas Engineer and Manager.
Malvern.

GAS TAR and Ammoniacal Liquor Wanted.
Apply to JOSIAH HARDMAN, Milton, STAFFS.

WANTED, four Purifiers, 10 or 12 feet square, Connections, Valves, and Lifting Tackle complete; 8-inch CONDENSERS; WASHER or SCRUBBER, to pass 6000 Feet per hour. All second hand, or prices of above new, with Specifications.
Address P. PATERSON, Solicitor, Secretary, Gaslight Company, Maybole, AYRSHIRE.

SADLER & Co., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.
Correspondence invited.
Telegraphic Address: "Sadler, Middlesbrough."

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

BLUE PRINTS of all kinds in any weather. Drawings and Tracings promptly executed.
J. L. FEATHERSTONE, 21, Old Queen Street, WESTMINSTER, S.W.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating Price per ton and quantity, No. 2772, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

HOLOPHANE, LIMITED.

TEN £1 Shares, fully paid, for Sale.
SCRIVENER, Poplar Avenue, BIRMINGHAM.

FOR SALE—Four 8 feet square Purifiers, with 8-inch Connections and Centre-Valve, Lifting Gear, &c., complete. Also Four Sets of RETORT MOUNTINGS for 15-inch Round Retorts in Settings of Six; and Two 8-inch Four-Way Dry-faced BYE-PASS VALVES. No reasonable offer refused.
Apply to H. WIMHURST, Gas-Works, SLEAFORD.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also COMPLETE WORKS equal to 7000, 20,000, 60,000 cubic feet per diem. **Inquire and compare Prices and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

STATION METER FOR SALE.

OFFERS are invited for a Round Station METER, of Milne's Manufacture, 15,000 cubic feet capacity per hour, in first-class order, including 10-inch Connectors and Valve Bye-Pass.
The Meter is presently in use, having to be replaced by a larger one, and can be seen by applying at the Hawick Gas-Works.
J. SMITH,
Engineer and Manager.

WARRINGTON CORPORATION.
(GAS DEPARTMENT.)

REMOVAL OF WORKS.

FOR SALE—18-in. by 14-in. ⌂, and 15-inch and 18-inch Round, MOUTHPIECES, HYDRAULIC MAINS, ASCENSION-PIPES, FURNACE FITTINGS, EXHAUSTERS, TAR-WASHER, 18-inch CENTRE and FOUR-WAY PURIFIER VALVES, 12-inch HYDRAULIC CENTRE-VALVE, METER (12-inch Connections), ENGINES, PUMPS, &c.
Apply for Particulars to Mr. W. S. Haddock, Engineer.
FREDK. TAYLOR, Secretary.
Gas-Works, Warrington.

STRETFORD GAS COMPANY.

FOR SALE—
Two HYDRAULIC MAINS, 53 ft. 6 in. ong each by 20 in. wide by 22 in. deep.
Fourteen Cast HYDRAULIC MAIN STANDS.
Seven Cast BENCH GIRDERS.
Fourteen Cast BUCKSTAYS.
And a number of ⌂ RETORT MOUTHPIECES, 19½ in. by 15½ in., 5-inch and 5 in. by 4 in. ASCENSION-PIPES and 4-inch DIP-PIPES.
Apply for Particulars to Mr. H. Kendrick, Engineer.
Offers to be addressed to the Chairman of the Board of Directors.
BENJAMIN HAYNES,
Secretary.
Gas-Works, Stretford,
near Manchester.

RHOS GAS COMPANY, LIMITED.

THE Directors invite Tenders for Alterations and Extensions comprising RETORT-BENCH, ENGINE and EXHAUSTER, SCRUBBER, PURIFIERS, STATION METER, GADD & MASON GASHOLDER in Steel Tank CONNECTIONS, &c.
Drawings and Specifications may be seen at the Company's Office, Ruabon, or on application to Mr. W. Belton, Shrewsbury, from whom any further Information may be obtained.
Sealed tenders, endorsed "Tender for Alterations and Extensions," must be sent in, addressed to the undersigned, on or before the 5th day of April, 1897.
The Directors do not bind themselves to accept the lowest or any tender.
GEO. E. WOODFORD,
Secretary.
Ruabon, March 19, 1897.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH,
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to
No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

ECONOMY IN PURIFICATION.

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.
And J. EVERY & SON, Phœnix Iron-Works, LEWES.

TO GAS AND WATER OFFICIALS.

SPECIAL and favourable Terms for CYCLES are offered. The very best "up-to-date" Cycle at a reasonable cost. Splendid value for money. Catalogue post free.
MELROSE CYCLE COMPANY, COVENTRY.

TENDERS FOR GAS COAL.

THE Gas Committee of the Limerick Corporation invite TENDERS for the supply of GAS COAL for a period of One or Two Years.
For Particulars, apply to the MANAGER, Gas Offices, LIMERICK.
March 20, 1897.

CORPORATION OF LIMERICK.

THE Gas Committee are prepared to receive TENDERS for the supply and erection of a BENCH OF RETORTS, to produce about 600,000 cubic feet of Gas per day; also for a WROUGHT-IRON ROOF, and ALTERATIONS to Retort-House.
Drawings can be inspected, and Particulars obtained on application to
P. J. BAKER,
Engineer.
Limerick, March 10, 1897.

THE Directors of the Boughton Blean Gas and Coke Company, Limited, invite TENDERS for the supply and laying of 876 yards of 3-inch CAST-IRON GAS-MAIN in Boughton Blean Street, near Faversham.
Printed copies of the Specification and Details may be had in exchange for Postal Orders for 2s. 6d. from the undersigned; and sealed tenders, endorsed "Tender for Gas-Main," are to be delivered to him on or before the 12th of April next.
The Directors do not bind themselves to accept the lowest or any tender.
F. W. FULLER,
Secretary.
20, West Street, Faversham,
March 17, 1897.

RAMSGATE CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas and Water Committee invite TENDERS for the surplus TAR (140,000 Gallons or thereabouts), to be made between the 1st of April, 1897, and the 31st of March, 1898.
Tenders to be returned on or before Saturday, April 3, addressed to the Chairman of the Gas and Water Committee, Hardres Street, Ramsgate, and endorsed "Tender for Tar."
The Committee do not bind themselves to accept the highest or any tender.
Full Particulars on application to
WILLIAM A. VALON.
Engineer.

MORECAMBE GAS AND LIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company are prepared to receive TENDERS for the supply of 5000 Tons per Annum of screened GAS COAL, to be delivered on the Gas-Works Siding, Midland Railway, Morecambe, in such quantities as may be required during a period of One, Two, or Three Years.
Tenders, specifying the description of Coal, the Name of the Pit at which it is raised, and the Terms for net monthly payments, are to be sent in on or before Friday, the 2nd of April, 1897, endorsed "Tender for Coal."
The Directors do not bind themselves to accept the lowest or any tender.
WILLIAM DUFF,
Secretary and Manager.
Market Street, Morecambe,
March 18, 1897.

TUNBRIDGE WELLS GAS COMPANY.

TO COAL FACTORS AND OTHERS.

THE Directors of the Tunbridge Wells Gas Company will be prepared on Tuesday, the 13th day of April next, to receive TENDERS for the supply of 20,000 Tons of good, clean, unscreened GAS COALS, to be delivered free into the Gas Company's Siding on the South-Eastern Railway, at Tunbridge Wells, in accordance with the Terms and Conditions which may be obtained on application.
The tenders to be sent to me by not later than Six o'clock p.m., on Tuesday, the 13th day of April, marked "Tender for Coals."
The lowest or any tender will not necessarily be accepted.
By order,
JOHN READ,
Secretary and General Manager.
Gas Company's Office,
44, High Street, Tunbridge Wells,
March 24, 1897.

TENDERS are invited for Lighting the City of S. PAULO (BRAZIL) BY GAS, and must be sent under sealed covers, marked "Illuminação a Gaz da Cidade de S. Paulo," to the Secretaria da Agricultura, Commercio, e Obras Publicas (Department of Agriculture, Commerce, and Public Works), S. Paulo, Brazil, or to the Ministerio de Industria, Viação, e Obras Publicas (Ministry of Industry, Roads, and Public Works), Rio de Janeiro, in time to reach either of the said Departments not later than Three o'clock p.m., on the 30th of April, 1897.

Particulars may be had on application, by letter, to the Brazilian Legation, London; or to the Brazilian Consulates in London, Liverpool, or Glasgow, to the care of any one of which tenders may also be addressed, provided they are delivered soon enough to be forwarded for re-delivery to the said Departments by the date and hour above specified.

Plans of the City of S. Paulo may be inspected at the Brazilian Consulate, 6, Great Winchester Street, London, E.C.

TENDERS FOR GAS COAL.

THE Directors of the Watford Gas and Coke Company invite TENDERS for the supply during the Twelve Months from the 1st day of July, 1897, to the 30th day of June, 1898, of 10,000 Tons (more or less) of GAS COAL, screened or unscreened, to be delivered at the Bushey Station of the London and North-Western Railway.

Forms of Tender and Information may be obtained on application (in writing only) of me the undersigned.

Tenders to be delivered on or before the 6th day of April, 1897, addressed to the Chairman of the Watford Gas and Coke Company, Watford, endorsed "Tender for Gas Coal."

Tenders must be on the form supplied, any alteration of which will invalidate the tender.

The Directors do not bind themselves to accept any tender.

WILLIAM ROWELL,
Secretary.

Gas and Coke Company's Offices,
Watford, March 11, 1897.

THE FARNHAM GAS COMPANY, LIMITED.

TENDERS FOR COAL.

THE Directors of the Farnham Gas Company, Limited, are prepared to receive TENDERS from Persons willing to supply and deliver, free of all Dues and Charges, at the Farnham Station, London and South-Western Railway, 2100 Tons of the following descriptions of GAS COAL—viz., New Pelton, Pelaw Main, Aldwarke Main, or Strafford Silkstone—to be delivered in quantities of 50 Tons (at intervals) before the 31st of March, 1898. The Coals to be consigned to the order of the Farnham Gas Company, Limited, at the Farnham Railway Station.

In the case of Seaborne Coal, the Meter's Certificate of each quantity to be duly sent with invoice of same.

Payment monthly.

Sealed tenders, marked "Tender for Coal," to be delivered to the Secretary, Mr. W. Wells, 112, West Street, Farnham, Surrey, not later than Eleven o'clock a.m., on Saturday, the 3rd of April, 1897, *of whom Forms of Tender may be obtained.*

The Directors reserve the right to reject the lowest or any tender.

March 15, 1897.

BOLTON CORPORATION,
(Gas Department.)

TENDERS FOR TAR.

THE Bolton Corporation Gas Department are prepared to receive TENDERS for the purchase of TAR to be produced at their Gas-Works during the Year ending the 31st of March, 1898.

Approximate quantity, 6000 Tons.

The Tar will be delivered into Contractors' Tanks at the Craddock Lane or Bullfield Siding on the Lancashire and Yorkshire Railway, Bolton.

Tenders, endorsed "Tender for Tar," and stating Price (payable in advance) per Ton of 2240 lbs. to be addressed to Mr. Alderman Miles, Chairman, and delivered at the Gas Offices, Bolton, on or before Thursday, the 1st of April next.

The highest or any tender not necessarily accepted.

By order,
R. G. Hinnell,
Town Clerk.

Town Hall, Bolton,
March 17, 1897.

HARTLEPOOL GAS AND WATER COMPANY.

IMPORTANT SALE OF SHARES.

TO be Sold by Auction, at the Company's Offices, Middleton Road, West Hartlepool, on Thursday, the 25th day of March, 1897, at 3.15 p.m. precisely—Mr. John Hunter, Auctioneer—500 SHARES OF £10 EACH (Maximum Dividend limited to 7 per cent. per annum), being part of the Gas Capital authorized to be issued by the Hartlepool Gas and Water Act, 1878, and required by Section 9 of that Act to be offered to the public for Sale by Auction.

The above Shares will be entitled to Dividend from the 26th day of April next, and to be registered in the name of the Purchaser without charge. A Deposit of 10 per cent. will be required to be paid at the time of Sale; the remainder to be paid on or before the said 26th day of April.

The Shares will be sold in Lots of Ten each.

By order of the Directors,
Thos. Trewhitt,
Secretary.

Hartlepool Gas and Water Company's Office,
West Hartlepool, Feb. 22, 1897.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

CHELTENHAM.

IMPORTANT SALE OF CHELTENHAM GAS STOCK.

HARRISON, BAYLEY, and ADAMS have received Instructions from Trustees to SELL BY AUCTION, at their Mart, Clarence Street, on Thursday, March 25, 1897, commencing at Four o'clock precisely, and subject to Conditions of Sale, £5000 CONSOLIDATED ORDINARY 5 PER CENT. STOCK of the Cheltenham Gaslight and Coke Company, Limited, in Lots of £100.

For further Particulars, apply to Messrs. Winterbothams & Gurney, Solicitors, Essex Place, or to Harrison, Bayley, & Adams, Estate and House Agents, 4, Promenade, both of Cheltenham. (Telephone 102.)

BY EDWIN FOX AND BOUSFIELD,
AT THE AUCTION MART,
ON WEDNESDAY, MARCH 31, AT TWO,
IN NUMEROUS LOTS,

By order of Executors of the late Alfred Marriott, Esq.

GAS and Water Stocks and Shares in first-rate Dividend-Paying Companies, amounting at present Prices to about £65,250, affording highly Remunerative Investments of a character rarely offered to competition, as under:—

SOUTHWARK and VAUXHALL WATER	£4080
WEST MIDDLESEX WATER-WORKS	£400
LAMBETH WATER-WORKS	£5875
EAST LONDON WATER-WORKS	£5550
CHELSEA WATER-WORKS	£866
NEW RIVER (Two New Shares)	£200
GASLIGHT AND COKE	£8230
SOUTH METROPOLITAN GAS	£4610
COMMERCIAL GAS	£2800
CITY of LONDON ELECTRIC LIGHTING	£1100
BRENTFORD GAS	£700
CROYDON COMMERCIAL GAS	£500
BRIGHTON and HOVE GENERAL GAS	£1000
HASTINGS and ST. LEONARDS GAS	£500

Nominal Value about £37,000.

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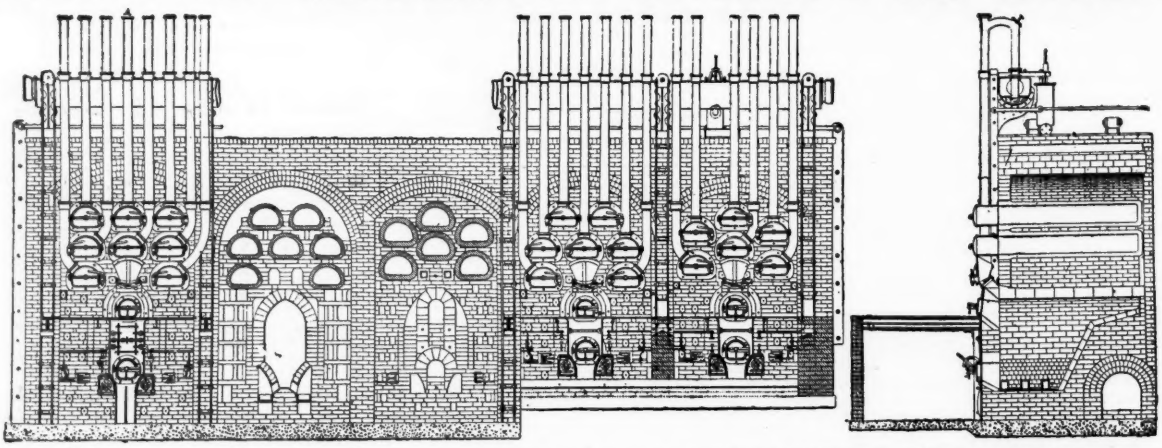

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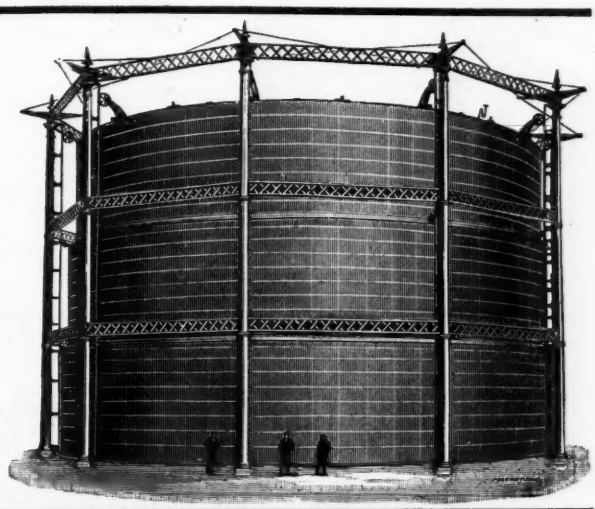

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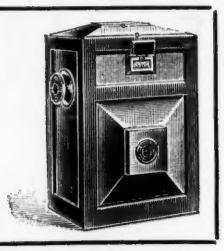

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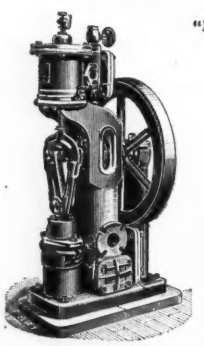

Fig. 703. "SINGLE RAM" STEAM-PUMP.

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

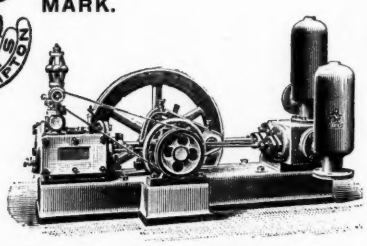

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

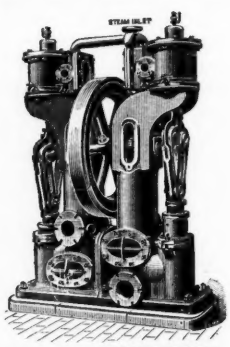

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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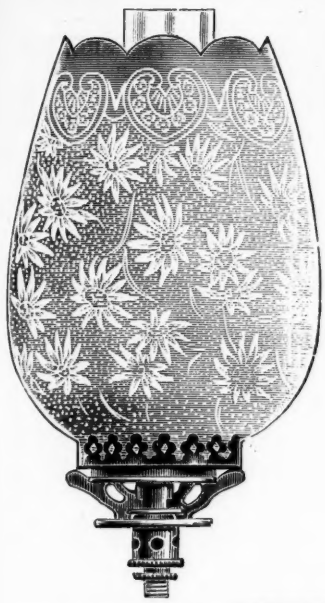

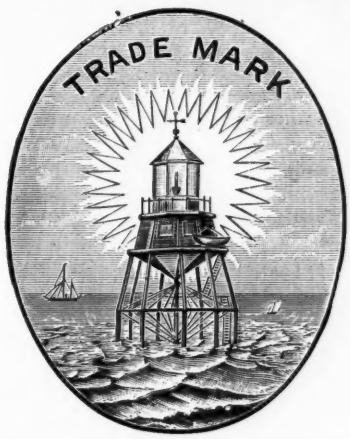

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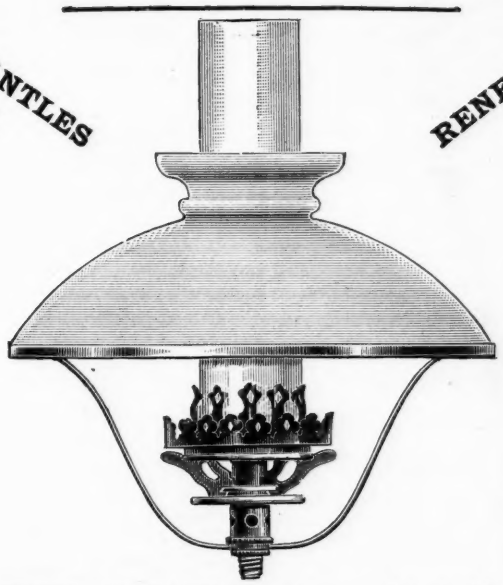

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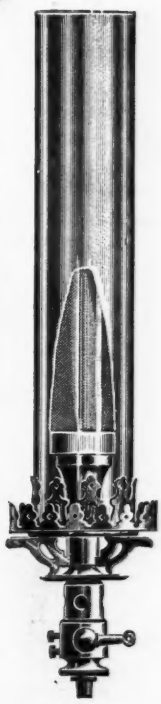

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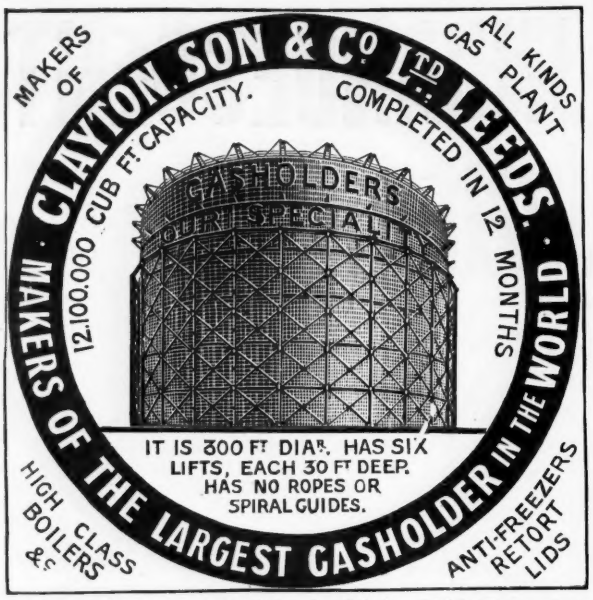
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12,100,000 CUB FT CAPACITY.
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GASHOLDERS
SPECIALITY
IT IS 300 FT DIAR. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
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These **Patent Twisted Taper Rymers and Taps** are the best ever made for Gas and Water Service Connections. A true Hole and a correct Thread can be assured. They are easy to work, and will last much longer than straight grooved Taps and Rymers.

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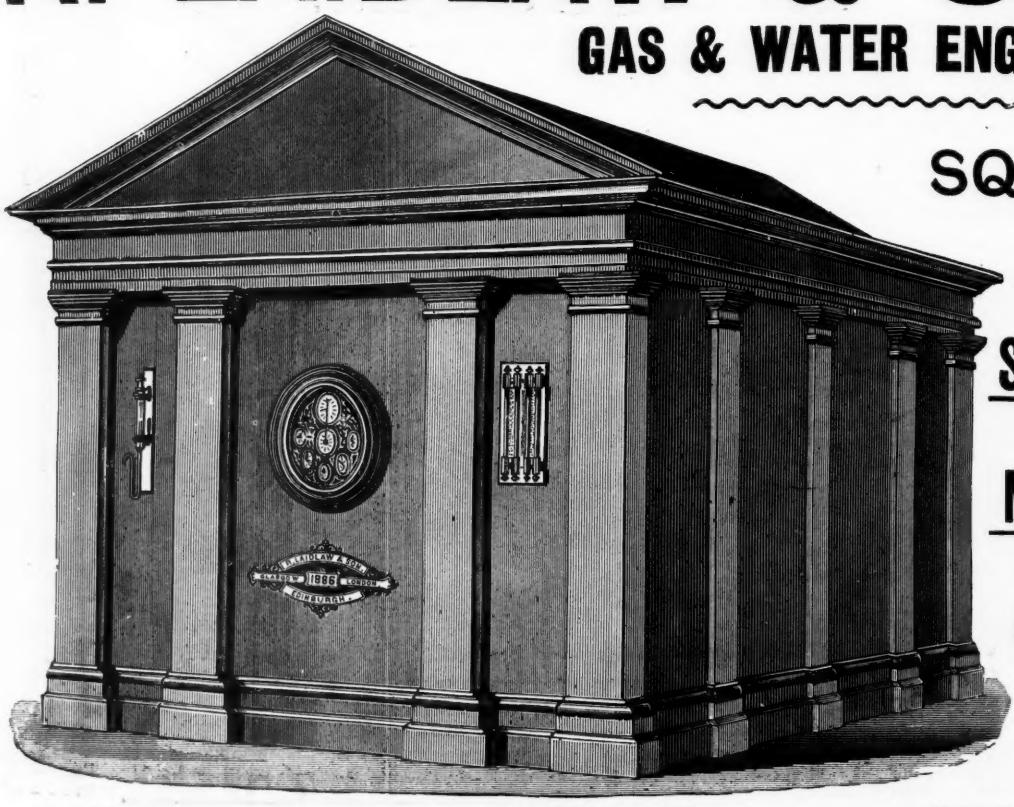

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ALL SIZES.

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Have constructed their EUROPEAN type of

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At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Preston	1,500,000 Cub. Ft.
Belfast	1,700,000 ,,	Southport	750,000 ,,
Belfast (Second Contract)	4,500,000 ,,	Bath	1,000,000 ,,
Glasgow	300,000 ,,	New York	1,200,000 ,,
Brussels	700,000 ,,	Newburgh, N.Y.	350,000 ,,
Brussels (Second Contract)	700,000 ,,	St. Joseph, Mo.	750,000 ,,
Liverpool	3,500,000 ,,	Winchester	200,000 ,,
Tottenham	750,000 ,,	Hoylake	125,000 ,,
Tottenham (Second Contract)	750,000 ,,	Shanghai	225,000 ,,
Santiago	400,000 ,,	Holyoke, Mass.	600,000 ,,
Swansea	750,000 ,,	Stockport	500,000 ,,
Brighton	1,500,000 ,,		

And have now under Contract:—

Manchester	3,000,000 Cub. Ft.	Brentford	1,100,000 Cub. Ft.
Edinburgh	2,000,000 ,,	Commercial Gas Co., London	850,000 ,,
Stockton-on-Tees	500,000 ,,	Middlesbrough	1,250,000 ,,
Norwich	1,000,000 ,,	Coventry	600,000 ,,
Guildford	350,000 ,,	Lea Bridge	350,000 ,,
Syracuse, N.Y.	850,000 ,,	Bridlington	125,000 ,,
Newburgh, N.Y. (Second Contract)	250,000 ,,	Bordentown, N.J.	125,000 ,,

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

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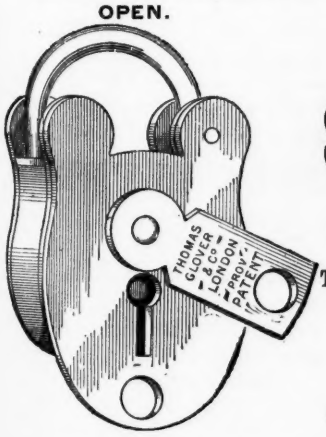

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SECURE PADLOCK

Prevents Tampering with the

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark.
Eyelets easily fixed and removed by Company's Collector.

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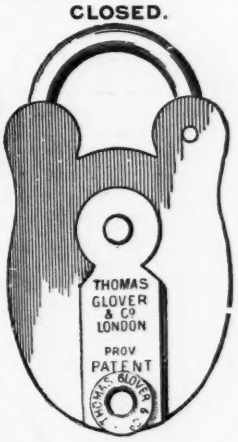

Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

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Established 1860.

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RETORTS AND FIRE-BRICKS.
BEST QUALITY.

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NATURAL BOG ORE FROM OWN MINES.
Samples and Prices on application.

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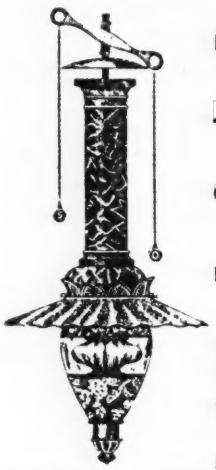
The Climax of Regenerative Gas Lighting!!



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A 280-CANDLE POWER
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CLASS A— 55/-
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England.

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Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.
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ESTABLISHED 1836.

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WORTLEY FIRE-CLAY WORKS,
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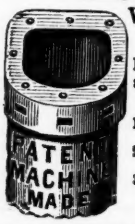

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1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
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Sulphate of Ammonia Apparatus.

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ON THE CONTINUOUS SYSTEM

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Full Particulars may be obtained from the Sole Makers,

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[See Illustrated Advertisement, March ?, p. 453.]

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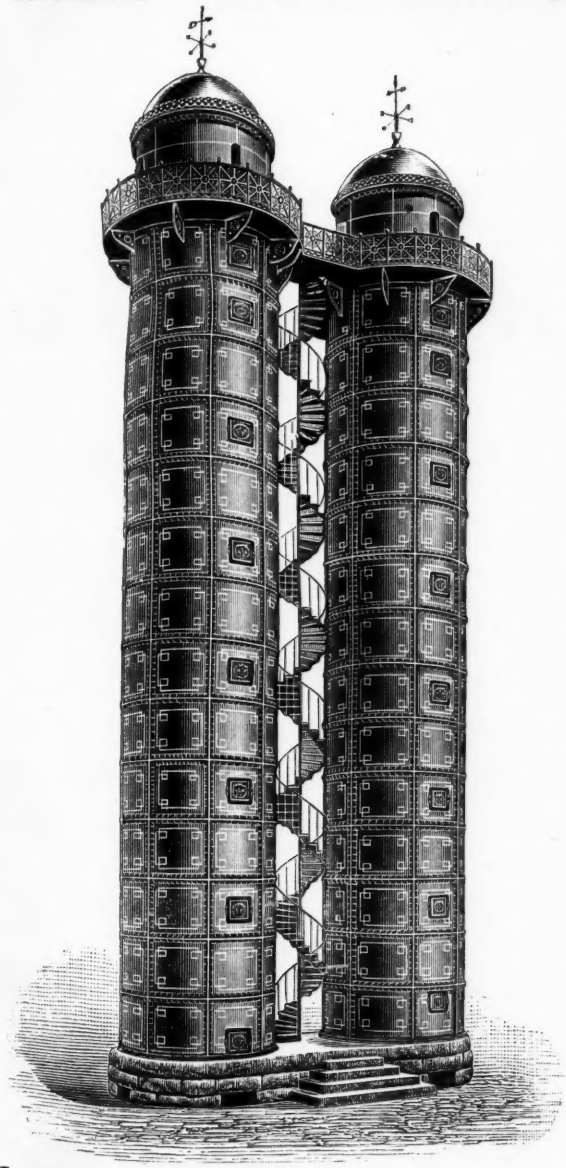

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Messrs. R. & J. D. wish to specially direct the attention of Gas Managers to the larger quantity of Ammoniacal Liquor or Sulphate **made** by their Scrubbers than by any of the numerous Rotary and other Machines now upon the Market. From 28 lbs. to 34 lbs. of Sulphate are produced (per ton of coal carbonized) by their Scrubbers; whereas 20 lbs. to 22 lbs. is as much as can be got by the Machines. Gas Managers with low yields of Sulphate should not rest satisfied (because Ammonia does not show on test papers) until they are getting all the Ammonia it is possible to make. It should be remembered that each gallon of liquor, or 1 lb. of Sulphate, is worth about 1d.; thus, when every ton of coal carbonized is multiplied by 6d., 8d., 10d., or 1s., from increased yield of Sulphate on the quantity of coals used per annum, a very large extra profit is made. **Irrespective of the profit made from the increased yield of Ammonia, these Scrubbers utilize the Ammonia as a purifying agent, and very considerably reduce the amount of work to be done in the purifiers.**

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All the Meters (which number 14) at the Beckton Station of THE GASLIGHT AND COKE COMPANY have been erected by the above Firm.

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A very large number are now at work; and all Engineers who have adopted them speak in unqualified terms of their great efficiency.

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[See also Advt. p. 640.

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